SEPTEMBER 26, 1936

ELECTRICAL WORLD

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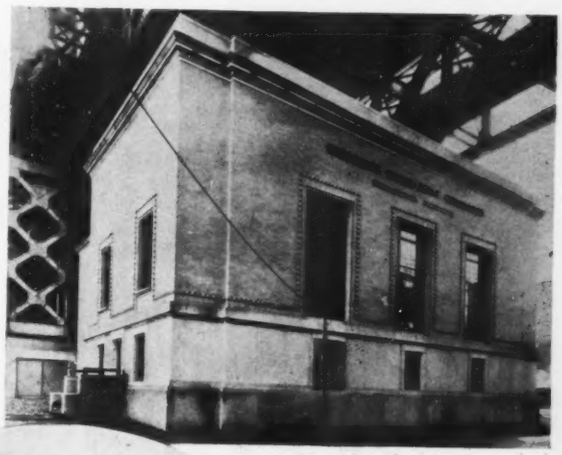
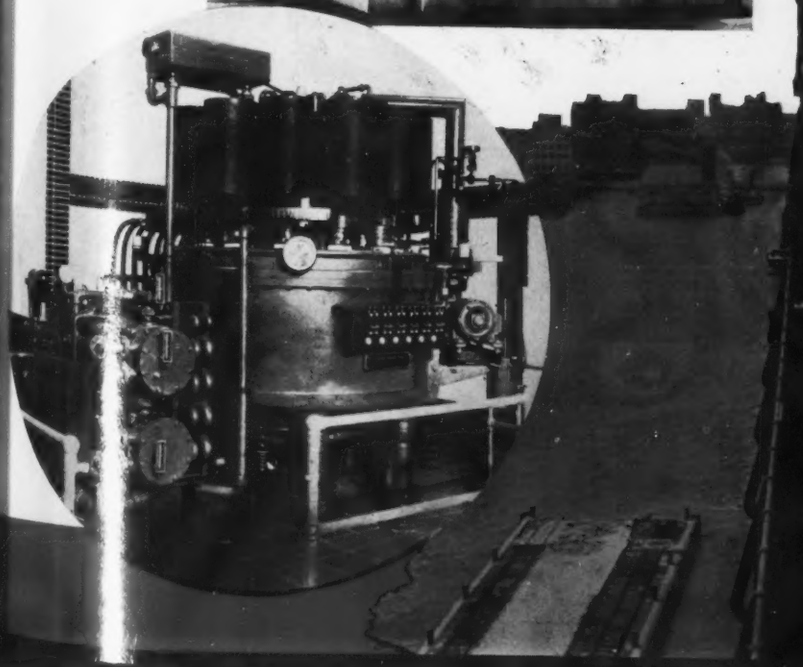
ELECTRIC TRANSIT ACROSS THE DELAWARE

Power from Philadelphia Electric & Public Service of New Jersey. Transformers, switchgear and rectifiers in two under-the-bridge substations are Allis Chalmers





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Coming Features

Industrial Modernization

A comprehensive report on industrial electrification, covering such aspects as motorization, instrumentation, control, wiring, etc., will be featured in a special section of Electrical World of October 24.

Apartment House Adopts Electrc Kitchen

Change from gas to electric service in 241 apartments of a large New England hotel apartment house was made without delay or complaint. Details of the installation and wiring are given in an article soon to appear.

Superposed Turbine For Fisk Street Station

Work has started on addition of a high pressure high temperature turbine to be superposed on two existing machines in the historic Fisk Street Station of Commonwealth Edison Co. Details of the installation are soon to apepar in an article by Bernhard Schroeder.

Cover Picture

Power for the high-speed trains now running over the Delaware River Bridge between Camden and Philadelphia is provided by four 2,000-kw., 630-volt mercury-arc rectifiers, 12,500 kva. of transformer capacity and 26 armor-clad switchgear units. High-speed train service over this 2.68-mile long bridge shown on the cover was inaugurated this summer.

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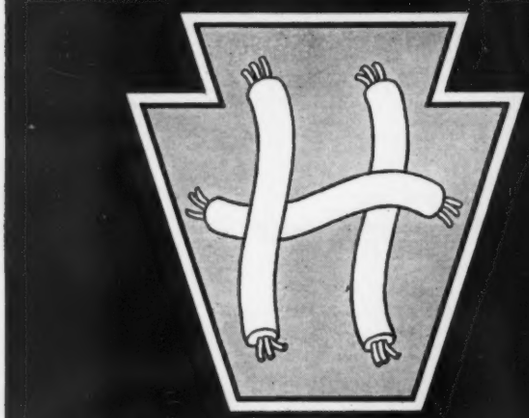

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LETTERS TO THE EDITOR

Reflectors for Street Lighting

To the Editor of ELECTRICAL WORLD:

Shielding-reflector type street lighting, introduced in this country as far back as 1912 and abandoned in favor of refractors because of the high cost of the close spacing which such reflectors require, has recently been taken up in Europe.

Properly built shielding reflectors interpose a shield between the filament and an observer at normal angles of vision. For complete elimination of glare this shield should extend to about 65 deg. from the nadir. A considerable part of the glare may be eliminated, however, if cut-off occurs between 75 and 80 deg. and the maximum beam of light is depressed to about 65 deg. This arrangement requires closer spacing than is customary with refractors. Theoretically, uniform illumination with maximum beam candlepower at 68 deg. requires a spacing of five times mounting height.

In producing uniform illumination there is a certain angle of maximum candlepower, below which reflectors provide greater efficiency than refractors and above which refractors provide greater efficiency than reflectors. This angle varies with the type of equipment, but is generally about 65 deg. Past practice in this country with spacing-mounting height ratios of 6 to 12 has, therefore, properly been refractor practice.

In considering the application of reflector units in America it must be remembered that the illumination should be adequate and that the spacing-mounting height ratio not greater than 5–1. Some of the installations in our business sections have that ratio, but generally in these cases the tunnel-like effect of no upward light that would be produced by shielding reflectors is to be avoided. Since there are few other installations in America with spacing height ratios as low as 5–1 it will be necessary to confine use of the new reflectors largely to new installations.

T. W. ROLPH,
Chief Engineer,
Holophane Company, Inc.,
New York, N. Y.

•

Tax Difference Pays Whole Electric Bill

To the Editor of ELECTRICAL WORLD:

So you apologize to Seattle. I wonder why? Mr. McKeen's letter is very interesting, not to say amusing, and what he says, from his viewpoint, is very true. But before any one moves to Seattle, under the impression that his taxes will be low because the earnings of the municipal utility are making it a tax-free city, he should read the following extract from Seattle's Chamber of Commerce "Facts Worth Knowing about Seattle," dated May, 1935:

"Real Estate and Taxation: Total value of real and personal property in Seattle in 1934, $584,686,854. Assessed valuation, $292,434,427. Property assessed at 50 per cent of its true value. Tax rate on $1,000 assessed value: State, $6.52; City, $20.78; County, $19.53; Schools, $15.30; Port, $0.50. Total, $62.63."

In Madison the total charge is $23.50 on full value. The difference in taxes on a $7,000 house will more than pay the electric bill in Madison of the occupant of that house. Where is the saving? But that is not the only reason why an apology was not required. On the first of last September, while in Seattle, I picked up a copy of the Washington *Post-Intelligencer* which contained the following item:

"The deficit in the city's general fund is steadily mounting as the result of the unbalanced 1935 budget.

"This was revealed yesterday when a report filed by the City Comptroller, Harry W. Carroll, with the City Council giving the results of his monthly check-up of funds in the city treasurer's office showed that the general fund had $3,406,041.84 in outstanding unpaid warrants on August 31, with only $26,277.47 on hand to meet them.

"The street railway fund was also heavily overdrawn, having $1,405,628.03 out in warrants and $69,566.86 on hand in cash."

The relation of this to the municipal light plant is quite clear. If the municipal utility had been paying taxes at the same rate as the Madison Gas & Electric Company a goodly portion of this deficit could have been liquidated.

For the past three years the neighboring Portland General Electric Company has paid in taxes $3,899,023.32, whereas the Department of Light of Seattle has paid less than 16 per cent of this amount. It is true that the yearly gross income of the Portland utility was approximately 1.45 times that of the Seattle utility, but if allowance is made for this difference in income the Seattle utility should have paid approximately $2,700,000 during the past three years. The rates of the Portland General Electric Company are lower than the rates of Seattle. See the Federal Power Commission reports.

The apologists of the municipal plant always make great claims as to savings. Perhaps people of Seattle are better judges of this than any one else. The Municipal League of Seattle recently made a more rational estimate of the savings. In its report it says:

"The computation shows that, in comparison with Spokane rates, there was a total saving to the City Light customers of $842,000 from 1905 to 1914 inclusive, and that there was a saving of $326,000 from 1915 to 1926—after providing for the increase in cost to users of $290,000 for the three years, 1920-22, when rates had been raised, resulting in the average customer paying each month 10 cents more in Seattle than he would have paid in Spokane. Adding the net saving for the two portions of the period, we have a total saving of $1,168,000 to 1925 inclusive. There has been no saving during the subsequent eight-year period.

"During this same 21-year period, had taxes been charged and paid in the amount of 10 per cent of the gross revenue, the amount of taxes received by the community would have been $3,278,000. Even if it is assumed that the customers of the private utility serving the Seattle district benefited by the competition of the municipal light plant in a proportionate measure, which is a fair assumption, the total savings of all customers in the Seattle district would not have exceeded the amount of taxes lost to the community."

Lastly, if Representative Rankin's figures on the consumption and costs of energy in Wisconsin are correct, all the electrical energy sold in the State of Wisconsin in 1934, if sold at the average rate of 1.977 cents per kilowatt-hour—the average rate at Seattle for 1933—it would have cost $300,000 more than it did. The utilities returned to the various governments between five and six million dollars in taxes, so why apologize?

C. M. JANSKY,
Professor of Electrical Engineering
University of Wisconsin, Madison.

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Will the Public Intervene?

To the Editor of ELECTRICAL WORLD:

I have read with interest your editorial in the July 4 issue of ELECTRICAL WORLD. I think it is excellent, but being published in a magazine going largely to utility men it does not seem that it is as effective as it would be if made available to the general public. The utility men know what you are going to write before you put it down.

Your company also in its *Business Week* in the front pages usually lauds the accomplishments of the present Administration and on the last page lightly taps the Administration on the wrist.

In the last paragraph of your editorial apparently you think the public will not permit the destruction of the electric public utilities. Why? Has the public stepped in to save the railroads from destructive attacks by politicians? Not much, so far as I have observed. The railroads have had to fight their own battles.

Don't fool yourself or utility men into thinking the public will step in to save the utility industry from destruction at the hands of Mr. Roosevelt. We have had a one-man government at Washington since his election, and only the Supreme Court has saved the Constitutional rights of corporations and individuals to date.

Part of our troubles are due to the fact that we permit lawless government by politicians instead of lawful government by business men elected by voters. Only the election of men having a higher code of honor and business ethics will assure lawful government and fair treatment of corporations and individuals.

CHAS. E. WARSAW,
Kingston, Pa.

THE CAREFUL INVESTOR JUDGES A SECURITY

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A RECORD OF PERFORMANCE

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A Conference to Prevent War

"Your troubles over here are negligible things. How would you like to live in Europe these days? Every sane man there knows that the energies of each nation are devoted to war preparations, that war will come any day and that this war will destroy the world as we know it. Yet no one seems able to stop the torrent and you people seem blind to the fact that your country also will be brought into the world whirlpool sooner or later."

Such is the comment of the foreign delegates to the Third World Power Conference. This situation abroad is the background for their formal proposal that the United States call an international conference of leading business executives and industrialists to see if war cannot be prevented. Power, machinery and materials are necessary to war. Would it not be possible for business and industry to stop the deadly political tide that threatens to engulf the world in war? Such is the hope.

For unanimous agreement exists that Fascist and Communist world leaders are determined to wage war. They have built up nationalistic pride and spirit to fever pitch. This can be sustained only so long. War is the inevitable consequence of this political leadership. All attempts to stop this war movement by diplomatic means have failed. Great Britain tried, but only burned her fingers. In desperation she too has now gone to work to prepare for war.

We doubt that the United States would make any official diplomatic endeavor to avert this world war. The political answer given is: "If Great Britain couldn't stop the trend how could we, and why should we put fingers into the fire. Also, the American public does not approve of our mixing into the foreign mess!" This is about the official reaction to the proposed conference as given in the statements of Secretary Hull.

But why not by-pass officialdom? An international conference of business leaders needs no political support or surroundings. It is suggested that leading men could get together and state publicly that they will not support war. They will turn off the power. They will stop production of munitions. They will not pay the taxes to support war preparations. If this were done could the political leaders make war?

Probably not. But the plan is idealistic and impracticable. *Business leaders of the key war countries are not free agents.* They speak and move under political orders. They are already enmeshed in a spider web. They have no power to act. We believe the proposed conference is the only alternative to a coming world war, and we regret that it cannot be held. It is too late. Now we too must get ready for war.

And back of this coming war lies electric power. This fact is the major reason that each European country is putting on political pressure to hasten power developments. Political leaders realize that the use of an abundance of power multiplies man-power for war purposes.

Foreign delegates paint a black but realistic picture of world affairs. They seek our help, but have little faith that we can do anything to avert a world-wide catastrophe. What a commentary on the evolution of society toward higher ideals and advanced social standards!

Geo. W. Morrow

Editor.

TRACTOR BUILDS RURAL LINES

Speed and cost reduction accompanies use of tractors on rural lines of Northern Illinois Utilities Company. Digs 5-ft. hole, sets pole and moves to next location in three minutes.

Europe Has Harmony in Utility-Government Arena

Discussions at the World Power Conference Reflect Sane Political Economy in Governmental Relationship with Private Industry in Utility Service

Relatively few of the utility representatives of this country attending the World Power Conference at Washington week before last participated in the discussion. They chose to hold to their desire to have the remarks remain on a dignified professional plane, free from controversy and acrimony. But their silence entailed no sacrifice of their tenets and prerogatives.

It happened that the delegations from West and Central Europe sensed fully the persecution and repression to which the power business had been exposed in this country. In no uncertain terms they made it clear that government ownership and competition was no obsession abroad like what it had become here by political perversion.

On the contrary it was clearly established that even in nations that had gone through the turmoil of war, revolution and depression there was harmony between private and publicly owned plants, national governments tax them alike, rates and profits are comparable and, above all, the professional management is not harassed by a swarm of snoopers and irritants. Witness to this the following condemnations of remarks by certain of the delegates.

Belgium Shuns Competitive Waste

By Max Frederic Horn

Government Commissioner, Director of Sofina

What has struck me most is the consensus of opinion that appears to have been reached on several essential aspects of these problems in the deliberations of the conference.

1. The formerly much debated question of "competition versus monopoly" is practically eliminated from the field of discussion. It is recognized that duplication of plants must be avoided, and existing plants enabled to attain the highest possible degree of utilization. Hence the logical inference is that a generating or distributing utility must enjoy a monopoly, within an area as wide as may be necessary for the most economic operation.

2. For similar reasons—in order to avoid waste—coordination is commended in generation and distribution as well as in the use and husbanding of natural resources.

3. In much the same spirit it is generally agreed that the wealth invested in utilities shall not be wantonly rendered worthless, that is, destroyed. As Secretary Hull reminded the Conference, the forces of civilization must be directed towards construction and against destruction. Nor may Peter be robbed for the benefit of Paul.

Utilities must be allowed to earn fair return on capital prudently invested, and the preservation of this capital reasonably assured. The rate of remuneration should take into account both the risks assumed in the early stages of the venture and the advantages that accrue to the community from careful and progressive operation.

4. Since increased and more regular consumption tends to lower costs and consequently prices per unit supplied, it is a matter of public concern that the utilities' custom should expand. The public requires to be enlightened on the services which the undertaking and its customers can render each other. Admirable work is being done to this effect by the distributors and the governmental departments of the United States.

5. Opinion remains divided on the respective merits of public and private operation. However, the great majority of the governments represented at this Conference would appear to be opposed to nationalization of electricity and gas utilities; the Belgian Government for one would not countenance such a scheme.

6. A wide range of views subsists regarding the expediency of compulsive coordination and the point at which governmental supervision becomes interference in the desirable freedom of subordinate authorities or private enterprise. But here again there is an almost universal feeling that the might of the State should be subservient to the rights of the citizen.

•

Germany Supervises Without Invasion

By Carl Krecke

Director of Utility Economic Control

In principle we would deem it the task of Government to regulate and supervise business, and not to go into business itself. As far, however, as our Government by dint of previous development in our country does take an active part in the supply of gas and electricity, publicly-owned and private utilities are entirely co-ordinated. The principal aims of electric power and gas supply are reasonable rates and

safety of service. These aims may be realized only where the supply of gas and electricity is allowed to develop under the guidance of experts conscious of their responsibility, under no influence foreign to its nature, and in free competition. Private enterprise and Government will have to cooperate in creating such a situation.

Government leadership must, we think, assist *all* undertakings in the same manner, stimulating as well as regulating, and on the other hand intervene regardless of who the owners may be, wherever the common weal should require intervention. Consequently, Government will exert supervision in exactly the alike manner over utilities owned publicly by either the state itself or a municipality, or private utilities, or what we may term mixed ownership utilities.

We look upon private initiative as the stimulating and progressive element in every line of business. Sound commercial reasoning is indispensable in the gas and electric utility business and equally decisive for securing the benefit of the producer and the consumer. In what legal form an organization for delivery of electric power or gas is to be operated will be a secondary question. Of deciding importance are the spiritual forces expressing themselves in the conduct of the undertaking. Fostering the interests of the common weal will always be the supreme law of every responsible head of our utilities. That this supreme law be always fulfilled, Government is called upon to safeguard!

•

British Grid Run by Industry

By T. H. Minshall
Chairman Railway Gazette, London

Although admirably lucid accounts of the constitution and operation of the British grid and of the municipal utilities in Great Britain are contained in various papers before the Conference, it is possible that some misconceptions regarding them may still exist among certain of our foreign members.

1. The grid is neither owned nor operated by Government or by any government department. It is independently run by a Board of 6 men selected solely for their experience of the business, and it has no even remote connection with politics. The members cannot be changed and are not influenced by Government.

2. The grid was not built with government money but with the proceeds of bonds subscribed by the public at their own risk and without government guarantee.

3. Had the individual 600 utilities in Great Britain, both private and public, not been forbidden by law, nearly 50 years ago, to amalgamate, integration would by this time have gone a considerable way towards producing a grid or grids.

4. The grid does not deal, practically speaking, with the consumer directly. The retail consumer sometimes blames the grid because the exaggerated hopes of lower prices, held out by the press, have not yet fully materialized. The Board has the power to effect a general reduction of retail prices. The grid was not primarily intended to do this.

In fact, the primary object in establishing the grid was not so much any immediate reduction in operating cost as to save the waste of continual further capital outlay upon small and inefficient generating stations, operating at different frequencies and pressures.

There is little difference between private and municipal enterprises either in the rate at which they can raise money or, given similar areas, the rate they charge the consumer. Due to the publicity given to operating costs, there is a healthy rivalry to get the lowest cost, between managers of all electric utilities, irrespective of whether they are public or private.

As the area covered by private utilities in Great Britain is more than 20 times that covered by public utilities and the population density correspondingly less, it is remarkable that service and rates are of the same order in both classes of utility. No "yardstick" was required to bring this about, even had it been practicable to make a comparable one. The desire for increased sales, coupled with a very considerable sense of public duty in most private utilities are the main factors in rate reduction. But the essence of efficiency is largely the personnel of the management.

Direct regulation of pries by a central authority, except possibly in cases where a sliding scale of price and dividend is used, is no longer an important factor in promoting efficiency. While maximum rates are fixed by law, the bulk of rates charged in Great Britain are mainly fixed, either by the competition of other forms of power or—especially in recent years—by the desire to increase sales.

Co-operation Marks France

By Edmond Roux
Vice-President and General Delegate of the Association of Producers and Distributors of Electrical Energy

In France electrical accomplishment has been essentially due to private initiative under the control of public atuhority and with public financial aid in the case of rural electrification. Collaboration of private enterprise and the bureaus of government had always given the best of results. These have lately been confirmed and defined at the time of the creation of the Superior Council of Electricity and the formation of the National Corporation of the Rhone, organizations in which the industries and public authorities work in direct co-operation and in association with the representatives of users for the general interests of the nation.

We hope that such a formula of mutual collaboration in which private initiative should protect all its value will prove itself fruitful and competent to give continued aid to the development of the electrical industry in France.

•

British Committee Advocates Moderation

By John C. Dalton
Manager-Secretary London County Electric Supply Company

In my paper I stressed the point that private utilities in Great Britain are fortunately free from political violence and can rely upon a "square deal" from the Regulatory Bodies. The British Government set up a Committee to investigate the question of a reorganization of the distribution system of the country.

The report of that McGowan Committee rejects the suggestion which was strongly advanced by certain political factions that all private utilities should be bought out and come under public control; the suggestion is strongly rejected. The Committee recommends principally the retention and utilization of the larger and more efficient undertakings and the absorption by

[*Continued on page 98*]

More Outgoing Lines By Yard Modernization

T.V.A. Engineers Rearrange Wilson Dam Switchyards and Breakers for Twice as Many Outgoing Lines Without Extending Structure

By Llewellyn Evans . . . H. C. Daniels . . . R. M. Milton
Chief Electrical Engineer — Electrical Engineer — Substation Engineer
All of Tennessee Valley Authority

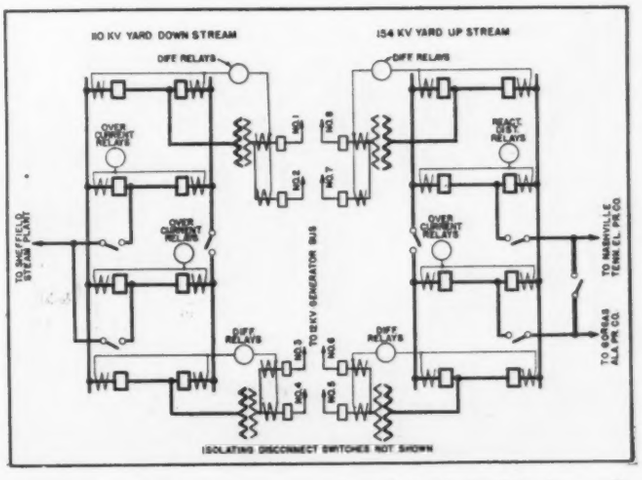
Utilities quite naturally should look for opportunities to make an equipment dollar go as far as possible. Here is a thoroughgoing case of increased service capacity with minimum commitment for major equipment. Commendable as it is, if this sort of thing went on forever the manufacturers would have to close up shop or sell suspenders. Meanwhile, the engineer is handsomely refuting the vague accusation that he has been profligate with the investing public's money. Here, however, it is taxpayers' money that is saved.

ORIGINALLY the 110-kv. and 154-kv. high-voltage switchyards at Wilson Dam hydro plant were constructed with straight double bus oil selector type switching and rigid iron pipe buses with steel-supporting structure. There is one transformer bank for each pair of the eight installed generators, two banks supplying the 110-kv. yard and two banks supplying the 154-kv. yard. The two yards are identical and all equipment is rated at 161 kv. and is interchangeable. The original yards each provided space for two outgoing lines with eight high-voltage oil circuit breakers in each yard, two on each transformer bank and two on each line, as shown on the single-line diagram (Fig. 1).

Under the original plan each line or transformer bank added would have required two additional oil circuit breakers and an extension of the heavy steel structure and buses. Studies of the existing installation were made to determine whether or not the switchyards could be rearranged or modified to provide space for additional lines more economically than by extending the old layout. Of several plans considered, the so-called "breaker-and-a-half" scheme was found most economical for meeting immediate requirements and also economically suitable for expansion to provide for future requirements. Where the old layout required four oil circuit breakers and two bays for one transformer bank and one line, the new layout will accommodate one transformer bank and one line in one bay with three oil circuit breakers. The single-line wiring diagram (Fig. 2) shows the new arrangement by which the number of lines which may be taken out of the old structure has been increased from four to eight without extending the structure.

Sixteen oil circuit breakers were originally installed to control four transformer banks and four transmission lines. Two additional transmission lines have been brought into the 110-kv. yard, making a total of four lines and two transformer banks which are now controlled by the same eight oil circuit breakers which were formerly required to control two lines and two transformer banks. The new arrangement makes it possible to group any line with any other line and to connect lines and transformer banks without going through a bus. This arrangement provides a maximum of flexibility in manual and automatic sectionalization by relays and gives complete protection against bus faults. To secure this full protection with the breakers shown in Fig. 2 it is necessary to operate normally with the main bus sectionalizing switch open. If this yard were extended and it were desired to operate all sections of the main bus connected together it would be necessary to install two additional breakers, so that there would be a breaker between each line and the main bus.

The breaker arrangement in the 154-kv. yard is the same as in the 110-kv. yard except that an additional breaker has been installed between the 154-kv.

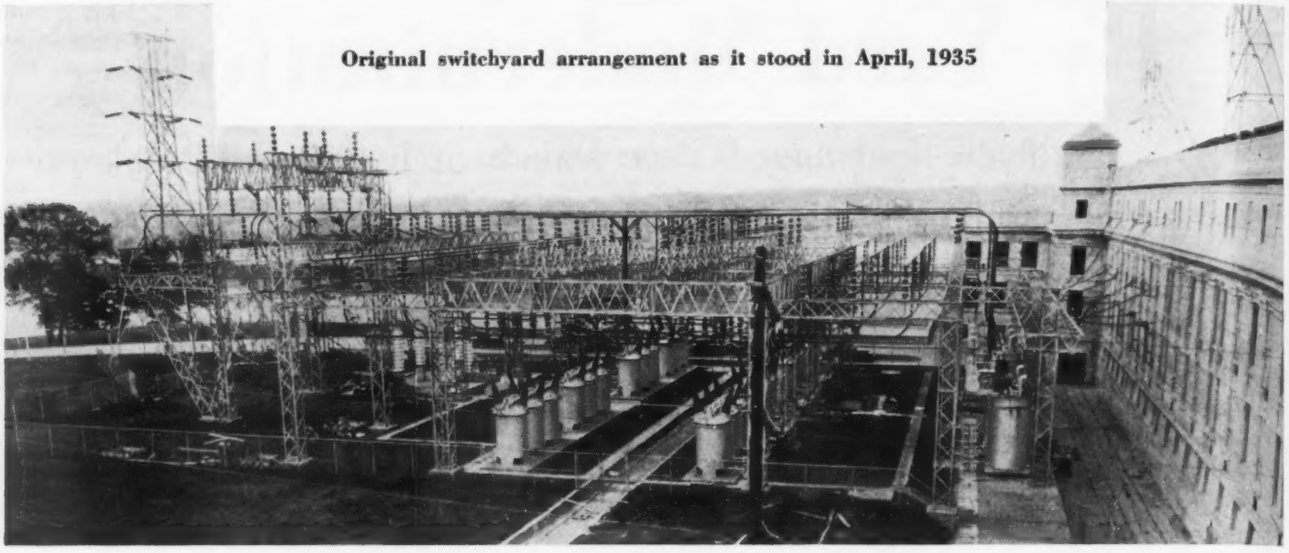


Originally Wilson Dam switchyard had double bus oil selector-type arrangement

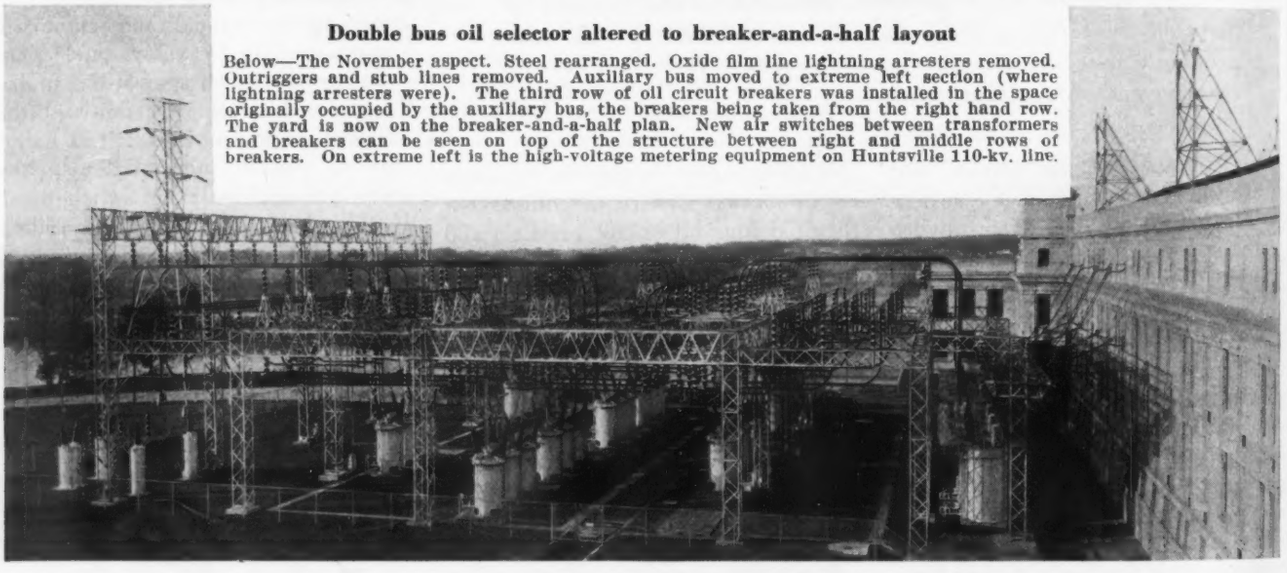
The layout required sixteen high-voltage oil circuit breakers for four transformer banks and four line positions.

lines to the Alabama Power Company and to the Tennessee Electric Power Company and the main bus. There may be times when it is desirable to operate these lines in parallel without connecting them to the station, and the additional breakers provide bus and breaker protection for these lines during such operation, leaving the other bus available for station operation of the other 154-kv. lines.

In order to use the breaker-and-a-half

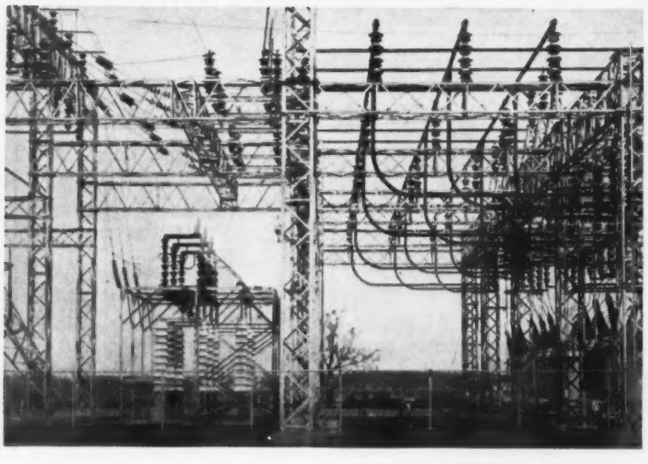


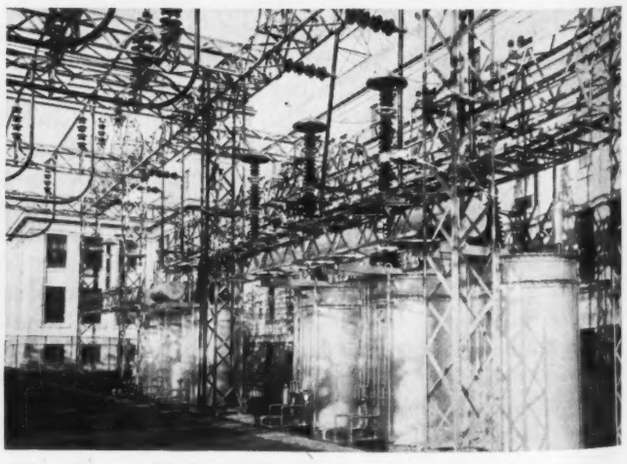
Original switchyard arrangement as it stood in April, 1935



Double bus oil selector altered to breaker-and-a-half layout

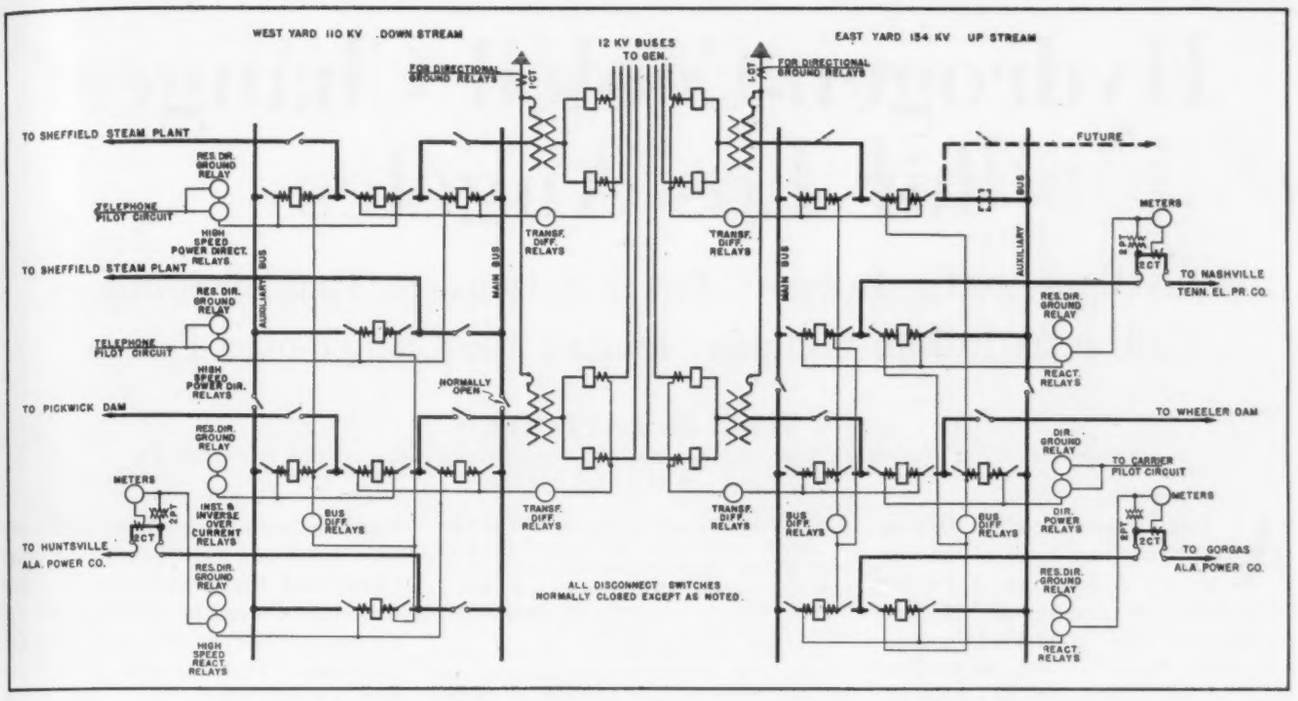
Below—The November aspect. Steel rearranged. Oxide film line lightning arresters removed. Outriggers and stub lines removed. Auxiliary bus moved to extreme left section (where lightning arresters were). The third row of oil circuit breakers was installed in the space originally occupied by the auxiliary bus, the breakers being taken from the right hand row. The yard is now on the breaker-and-a-half plan. New air switches between transformers and breakers can be seen on top of the structure between right and middle rows of breakers. On extreme left is the high-voltage metering equipment on Huntsville 110-kv. line.





New arresters mounted at transformer terminals

Left—Originally oxide film arresters were at line take-off location. They were removed. The auxiliary bus was moved into the released section. The third row of breakers was installed in the bay where the auxiliary bus is here.
Right—New 110-kv. station type arresters mounted beside the transformers and connected at the transformer terminals.



New breaker-and-a-half layout provides space for eight lines, originally four

Seventeen breakers control seven lines and four transformer banks in the same structure. There is space for one additional line, which will call for one more breaker. Complete relay protection is provided in the new layout. High-tension metering has been added on all interchange lines.

arrangement it was necessary to place the new third row of breakers in the section of the structure which was formerly occupied by the auxiliary bus and to move this bus over into the section formerly occupied by the line lightning arresters. Only minor modifications in the steel were required. The old oxide film arresters on the incoming lines were removed to smaller stations and replaced with station type autovalve arresters installed at the transformers and connected to the transformer terminals.

In the original layout the two high-voltage breakers on each transformer bank were out of service and could not be used when the bank was disconnected. In the new arrangement an additional air switch has been installed in the high-voltage transformer leads, which permits all breakers to be used for line switching with any transformer bank or banks out of service.

The protective equipment for the rearranged switchyards includes differential relay protection on each transformer bank and each high-voltage bus, except the sections of the main 110-kv. bus where this protection is not now needed, but would be added if the yard were extended and additional line breakers added; residual directional ground relays on all outgoing lines; high-speed reactance or distance relays on all lines connecting with foreign systems; high-speed directional power relays on all tie lines to other plants, and instantaneous and inverse over-current relays on outgoing feeder lines. High-tension metering equipment has been included for all lines interconnecting with foreign systems. Previously, interchange on these lines was measured on the low-voltage side of the transformers.

Rearrangement of the 110-kv. yard has been completed and all lines connected. The 154-kv. yard is now being rearranged.

In order to simplify the original arrangement of outgoing lines and to facilitate the bringing in of new lines the original yards were reversed; that is, the original 110-kv. yard was changed to the 154-kv. yard and vice versa. The entire change was made under normal load conditions.

THAT STEINMETZ STATEMENT

In addressing the Third World Power Conference, the President quoted an observation made in 1911 by Charles P. Steinmetz to the effect that "Electricity is expensive because it is not widely used and it is not widely used because it is expensive." The President added: "That observation still holds true." In 1911 the average annual energy consumption for residence customers was less than 260 kw.-hr. and the average price paid by the residential consumers was 9.43 cents per kw.-hr. For the 12 months ending July 31, 1936, the average annual residential energy consumption had risen to 701 kw.-hr. and the average rate had dropped to 4.84 cents per kw.-hr.—C. W. KELLOGG, President Edison Electric Institute.

Hydrogen-Cooled Changer for Los Angeles

Unit Used to Tie Bureau's Power Systems to That of Southern California Edison Company During the Change-over Period

By C. M. LAFFOON

Power Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

AT THE present time the Bureau of Power and Light of the city of Los Angeles has a project under way for changing its 50-cycle distribution and generating system over to 60 cycles. In order to provide steam standby for one-third circuit of the Boulder Canyon transmission line, and until such time as the bureau builds its own steam plant, negotiations were entered into with the Southern California Edison Company to supply this steam standby service.

Study proved that the installation of a 60,000-kva. frequency changer between the two systems was more economical than the other proposed scheme of remodeling a 50-cycle turbo-generator for 60-cycle service and then reconverting it for 50-cycle service after it was no longer required at the higher frequency.

The purchaser's contract specifications, therefore, call for a 600-r.p.m. hydrogen-cooled frequency changer consisting of a 60-cycle, 60,000-kva., 13,200-volt, three-phase, 0.8-power-factor generator, to have a short-circuit ratio of no less than unity, and an 11,500-volt, three-phase, 0.9-power-factor, 50-cycle motor of sufficient capacity to deliver full generator rating. The 60-cycle end of the set is also required to operate overexcited as either a synchronous motor or condenser with ratings of 50,600 kva. and 48,000 kva., respectively. The motor end is required to have a generator rating of 37,500 kva. A further requirement is that the set can be uncoupled in the future and operated as synchronous condensers on the city's 60-cycle system. Use of hydrogen as the cooling medium was selected since it has the following advantages:

(a) Reduced windage, friction and ventilating losses due to low density of the gas.

(b) Increased output per unit of volume of active material on account of the high heat storage capacity, thermal conductivity and heat transfer coefficients of hydrogen.

(c) Freedom from dirt and moisture reduces maintenance expense.

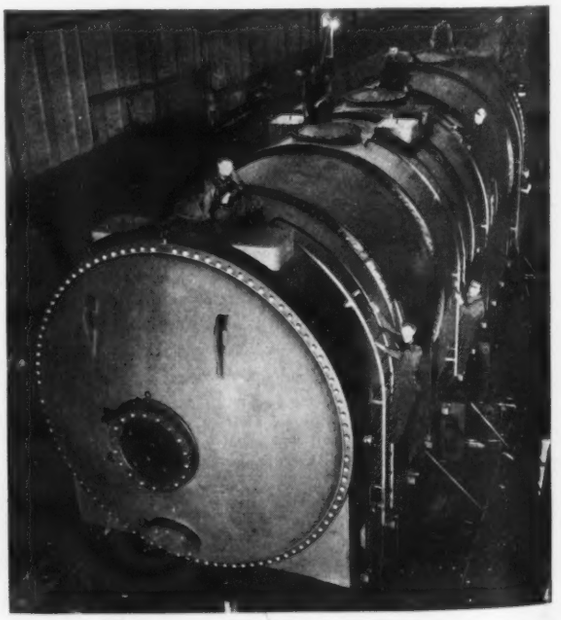
(d) Increased insulation life of stator windings on account of the absence of oxygen and moisture in the presence of corona.

Hydrogen for cooling frequency changers has not had as much consideration as for condensers in the past because the principal frequency changer application has been to convert from 60 to 25 cycles, for which a synchronous speed of 300 r.p.m. is required. At this speed windage, friction and ventilation losses are lower than for the higher-speed synchronous condenser, hence savings have been less. In the case of the 60- to 50-cycle frequency changer, however, the nominal speeds for ratings up to 75,000 kva. is 600 r.p.m., and an appreciable reduction in loss can be obtained by using hydrogen as the cooling agent.

Design of a 60,000-kva., 600-r.p.m., 60-50-cycle frequency changer set involves numerous mechanical problems irrespective of the cooling medium that is used. The major mechanical difficulty of this particular set was introduced by the contract requirement that the 50-cycle motor element was to be capable of operating as a 60-cycle condenser at 720 r.p.m. at a later date when the two units were separated. Both units are required to withstand an overspeed test of 25 per cent based on the 60-cycle operating speed, and the stresses in the rotor materials are not to exceed a definite percentage of the yield points of the materials. These speeds are 750 to 900 r.p.m., respectively, and it is therefore necessary in meeting stress requirements to use different dimensions, peripheral speed, proportions and quality of materials in the construction of the rotors.

In order to make tests and corrective changes possible to insure that the housing structure is gas-tight, this structure is being built at the manufacturers' works. The housing structure of the complete unit is arranged in six cylindrically shaped transverse main sections and two end head sections. Two sections form the frame

[*Continued on page 103*]



60,000-kva. hydrogen-cooled frequency changer for the Bureau of Power and Light, Los Angeles

New Pilot Protection Gives Reliability

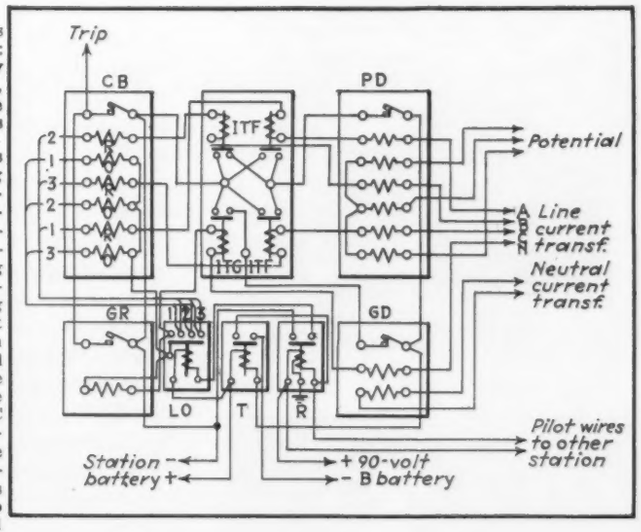
Simple Lockout System Uses Existing Telephone Wires Instead of Carrier Current for Pilot Protection High-Speed Relay System

By LLOYD F. HUNT
Southern California Edison Co., Ltd., Los Angeles, Calif.

The advantage of high-speed, single-line protection, operating without relation to external lines, has been known for many years. However, it has been only recently that systems of this type have been developed at a cost which justifies their use. The most common of these systems is the newly developed carrier-current pilot protection. This system takes advantage of locking out the tripping relays on through short circuits. Many schemes have been developed around this fundamental idea.

IN JULY, 1929, high-speed, single-line protection was installed on a 90-mile, 220-kv. section of the system of the Southern California Edison Company, Ltd. The only scheme available at the time in this country was known as the "Fitzgerald" carrier system. After a few years of operation it was considered necessary and advisable to develop a simpler and more reliable carrier-current pilot scheme. Five 220-kv. line sections were equipped with a new type of carrier current pilot protection ("Some Recent Relay Developments," L. F. Hunt and A. A. Kroneberg, *Electrical Engineering*, April, 1934). Experience with this type of carrier-current pilot protection indicated that the relays and their connections were quite satisfactory, but the carrier-current transmitters and receivers were subject to many kinds of trouble.

When the tie lines interconnecting the Big Creek hydro-electric plants were rearranged in 1934 it was necessary to equip them with high-speed, single-line protection. Advantage was taken of the open-wire telephone lines erected during construction of the plants for the transmission of lockout signal between plants. These lines are not on the same right-of-way as the transmission lines. It was necessary only to put the telephone lines in good operating condition and change the terminal connections. The distances between the plants vary from 1½ to 10 miles and little trouble was expected in the operation of the old telephone lines as pilot wires. Four of the five tie lines are equipped with pilot wire protection, the fifth one being equipped with carrier-current pilot protection of the same type as used on



The operation of this system is as follows: Ground tripping relay (*GR*) is a high-speed, overcurrent relay. Phase tripping relay (*CB*) is a high-speed, current-balance relay. This relay has an operating coil (*O*) and a restraining coil (*R*) per element. That is, one element has A phase current in the operating coil and B phase current in the restraining coil; the second element has B phase current in the operating coil and C phase current in the restraining coil, and the third element has C phase current in the operating coil and A phase current in the restraining coil. This relay was developed and used to simplify the system and at the same time not trip falsely on out-of-step conditions and not trip when two portions of the 220-kv. system are connected together out of synchronism. This relay will trip when the current in one operating coil is 10 per cent more than the restraining coil. Since this is a high-speed relay the only type of phase fault that it will not trip on is one that involves all three phases at the same instant.

In order to prevent the tripping relays from operating on through short circuits the operating coils of the tripping relays are short circuited by a lockout relay (*LO*). The determination of a through-phase-to-phase short circuit is made by the three-phase power directional relay (*PD*) and instantaneous phase overcurrent fault-detecting relay (*ITF*). The contacts of these two relays are connected in series. The setting of the fault-detecting relay is slightly lower than the minimum trip of the phase-tripping relay. Also, the determination of a through-phase-to-ground fault is made by the ground directional relay (*GD*) in conjunction with the instantaneous ground overcurrent fault-detecting relay (*ITG*).

The contacts of these two relays are connected in series. Either or both of these combinations when operated energizes the transmitting relay (*T*). When the transmitting relay operates the receiving relay (*R*) is energized through a separate 90-volt "B" battery. The pilot wires are also energized from this "B" battery. When the receiver relay operates the lockout relay is energized, preventing the tripping relays from operating.

Fig. 1—Relay system for direct-current pilot wire protection uses telephone lines

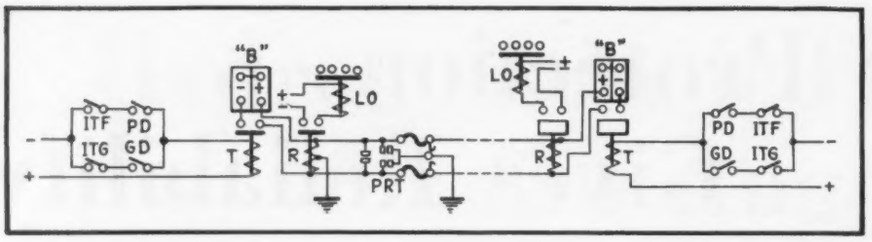


Fig. 2—Simplified diagram of the lockout system used in the d.c. pilot wire protective scheme

five line sections, as mentioned above. A simplified three-line wiring diagram of the relay arrangement as given in Fig. 1 and Fig. 2 is a complete schematic diagram of the lockout circuit. The relays are shown as described for Fig. 1. The receiving relays at the two ends are connected in parallel so that, regardless of which end of a transmission section detects the through fault, the tripping relays at each end are locked out of service.

It will be noticed that the receiving relay at one end has its winding grounded at mid-tap. This is to drain static from the pilot wires and to hold the relays at this station near ground potential. This end of the pilot wires is known as the grounded end. The other end is known as the ungrounded or floating end.

In case of a severe ground fault on the transmission system the ground potential between stations may be rather high. From studies and ground tests it is estimated that the maximum voltage difference will be approximately 5 kv. Therefore it is necessary to insulate the coil of the receiver relay, the "B" battery and the contacts of the transmitting relay from

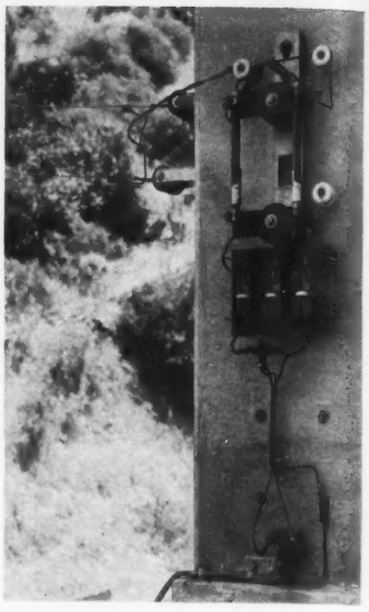


Fig. 3 — Protective device used at grounded end of pilot wires. Fuses and gaps are shown. Cover has been removed

associated elements. This is shown in Fig. 2 at the ungrounded end. The protection of the telephone line is at the grounded end and consists of two sets of gaps and fuses (*PRT*).

The receiver relays are designed to operate on 60 volts direct current, but require 400 volts, 50 cycles for minimum trip. Therefore induction to the pilot wires from ground faults must produce a considerable voltage between wires to operate the receiver relays. The breakdown voltage of the receiver end of the ungrounded terminal is approximately 20 kv. This gives a good margin for operating conditions.

The alternate group of relays is located at the lower portion of the panel (Fig. 4). Testing of the pilot wire circuit is done by operating a small toggle switch which energizes the transmitting relay. A voltmeter in parallel with the receiver coil at the grounded end gives the condition of the "B" batteries at both ends. Each operation of the lockout circuit is recorded by a telephone counter. In case a short circuit occurs during the time this circuit is tested the fault-detecting relay causes the test circuit to be interrupted, thus allowing the relays to function normally.

In order to contrast this system of lockout with the carrier-current channel the simplest form of carrier-current arrangement is shown by Fig. 6.

Since the relay scheme of this

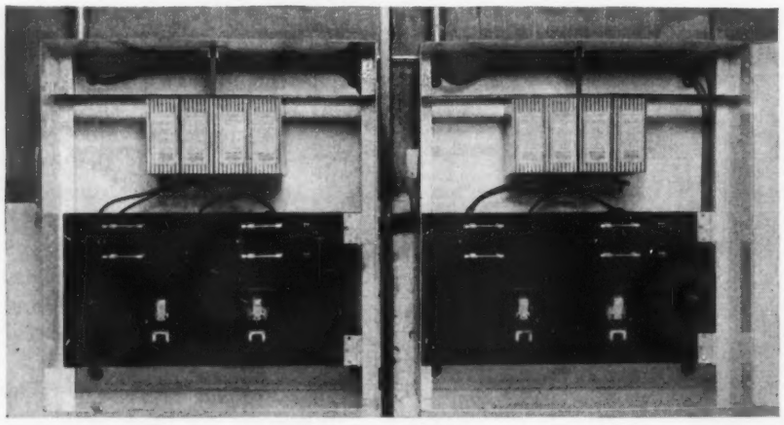


Fig. 4 — Transmitting and receiving relays (identified at *T* and *R* in Fig. 2) at ungrounded end of pilot wire

The "B" batteries of the ungrounded end are shown. The pilot wires are brought through the rear of the steel box by 10-kv. bushings.

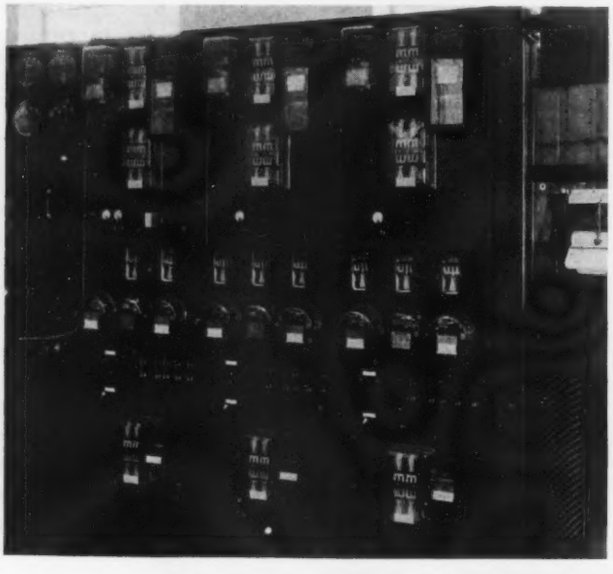
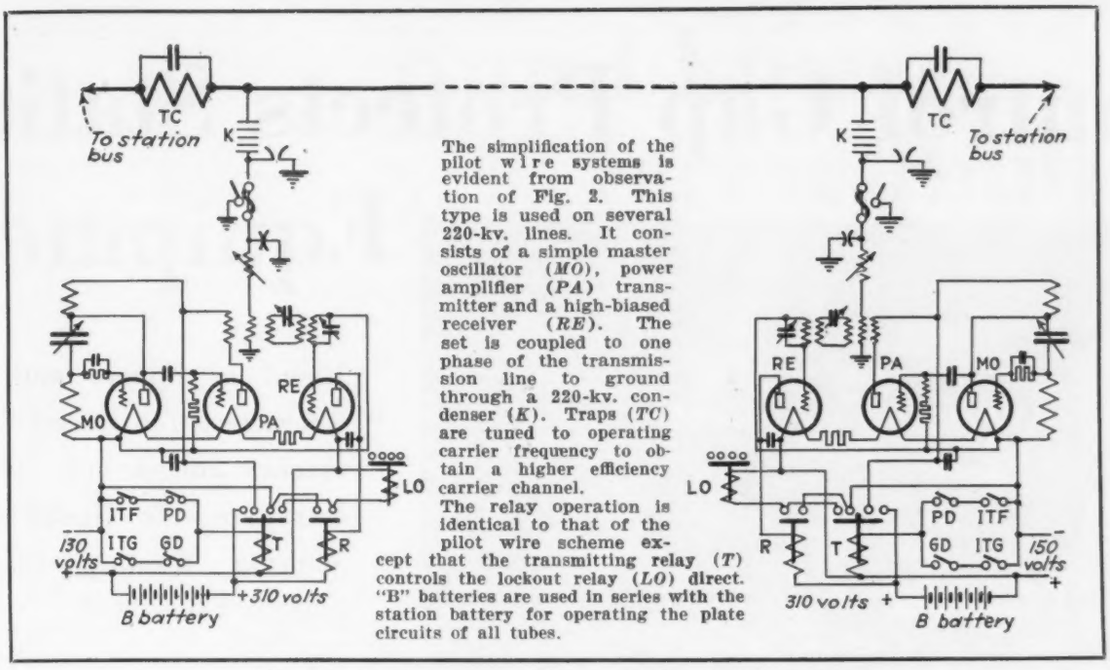


Fig. 5—One carrier and two pilot wire relay panels each contain the equipment for a single line

Transmitting and receiving relays on the panel at grounded end.



The simplification of the pilot wire systems is evident from observation of Fig. 2. This type is used on several 220-kv. lines. It consists of a simple master oscillator (*MO*), power amplifier (*PA*) transmitter and a high-biased receiver (*RE*). The set is coupled to one phase of the transmission line to ground through a 220-kv. condenser (*K*). Traps (*TC*) are tuned to operating carrier frequency to obtain a higher efficiency carrier channel. The relay operation is identical to that of the pilot wire scheme except that the transmitting relay (*T*) controls the lockout relay (*LO*) direct. "B" batteries are used in series with the station battery for operating the plate circuits of all tubes.

Fig. 6 — Carrier-current pilot protection lockout system

direct-current pilot protection is the same as carrier-current pilot protection the tripping times of the two schemes are identical.

As stated above, four tie lines were equipped with direct-current pilot protection system and one tie line was equipped with carrier. During the period of operation since installation the total time out for service for the four direct-current pilot protection systems was only a fraction of the time out for service of the one carrier-current protection scheme. Also, renewals are in this same order.

Excerpts from Address of Floyd L. Carlisle at World Power Conference Banquet

Our present machine age does not, of course, direct itself. It functions in accord with certain fundamental laws. As there are constant and unchanging moral laws, so also there are unvarying economic laws. One of the most important of these is that every enterprise, whether governmental or private, must pay its own way, must stand on its own feet. Except for great emergencies and for short periods, subsidized business cannot endure.

We, I believe, know how to adapt and adjust ourselves to new and changing conditions. Business and government have no natural or inherent antagonisms. While the prosaic production of goods and services has not the glamor of the monumental government undertakings, none the less, it is the base on which modern civilization rests its security.

The object of any organized society is to promote the greatest security, well-being, culture and happiness of its members.

The criticism of the American private utilities has related almost entirely to their financing. Some of that criticism was founded in fact, and the wrongs have been severely condemned by the leaders of the industry, but unsound finance is not representative or general in the business.

This is conclusively proved by the events of the depression. Various agencies of the federal government advanced money to municipalities, banks, railroads, insurance companies, housing projects, farmers and manufacturers. The amount exceeded four billion dollars plus the guarantee of farm and home mortgages.

Not one cent was loaned to private utilities. They were singled out for special heavy taxation, from which the municipal power operations were exempt. Judged by that test of unparalleled severity, the American private utilities amply demonstrated their financial soundness.

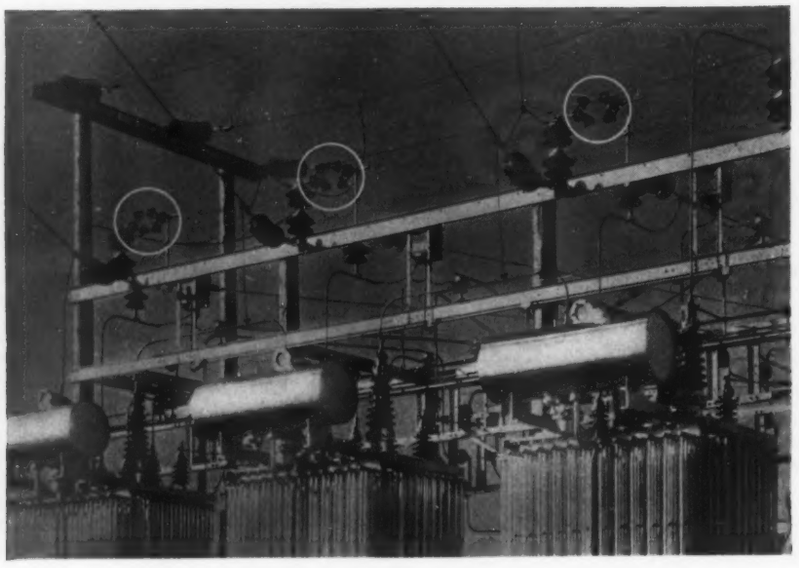
Those of us charged with management must not be denied the pride of truly great achievement. No industry in the world has been so generally useful in modern life, and contributed so much to our present civilization. With fair criticism we have no quarrel. But eternal wrangling will get us nowhere. The world today is more interested in the future than in the past. There is no power problem, certainly, in the U.S.A. that cannot be solved by fair negotiations and reasonable compromise.

I commend to the government and to the industry the application of Aristotle's Golden Mean.

Control Gap Protects Station Equipment

Blend of Sphere and Rod Characteristics Diverts Direct Strokes and Avoids Altered Performance Because of Varying Weather—Co-ordination Facilitated

By G. V. SMITH
Ohio Brass Company, Mansfield



Control gap has given three-year proof of service

69-kv. installation at Fan Hill substation of the (Los Angeles) Metropolitan Water District. Flux-control insulators can be rotated relatively or shifted longitudinally with respect to point-of-rod terminals.

IF IT were not for the innate idiosyncrasies of winding insulations, arresters, bushings, gaps and insulators with respect to time-lag of flashover the problems of insulation co-ordination would be simple. Under ideal equality of this characteristic it would only be necessary to proportion the strength of all insulation so that the less expensive and most easily replaceable equipments would be the weaker and thus protect the more expensive equipments. Unfortunately, the most expensive elements are generally the most vulnerable.

Any surge which conventional station equipment cannot handle must be headed off by some form of guard at the portal. With such deflection accomplished, the respective units of station equipment can be so designed as to afford maximum life and maximum continuity with minimum outlay for excess insulation and spacing.

When ordinary gaps (rings, rods and over insulators) are set high enough to minimize avoidable interruptions from transients of low crest and long duration they will afford little or no protection for the severe overvoltages that hold greatest possibility for destruction. Any effort to compromise gap settings to afford protection to equipment is accompanied by risk of more frequent interruptions. To escape this and to draw upon the most favorable characteristics of both the rod and the sphere there has been developed a composite control gap founded on the establishment of a relatively uniform dielectric field under all conditions. This lays the foundation for relatively flat time-lag characteristics (short time lag) without incurring the disadvantage of low-voltage flashovers under wet conditions. Tests under varying humidity show that time of control gap to flashover stays within limits of 3 per cent plus or minus. Minimum flashover voltages under wet conditions are reduced from 15 to 20 per cent below the dry values.

Severe direct strokes at or near the station are the crux of the protection problem. Ordinary gaps may not

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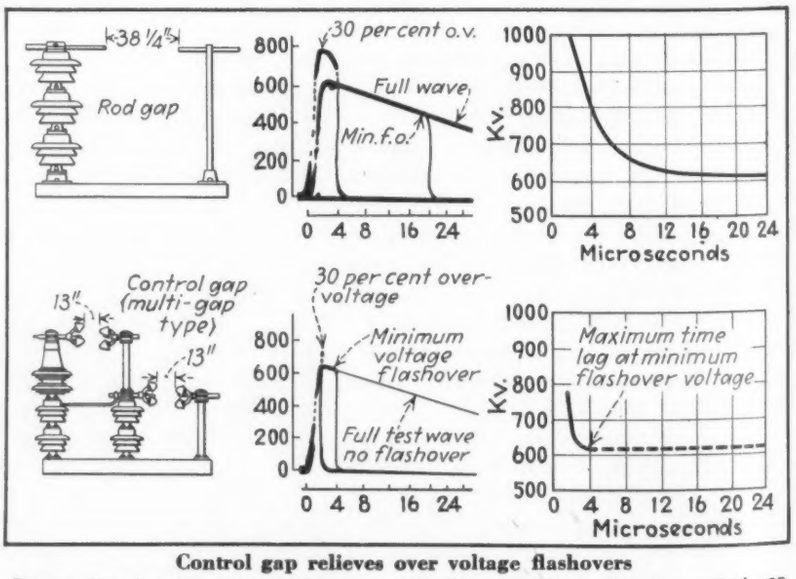
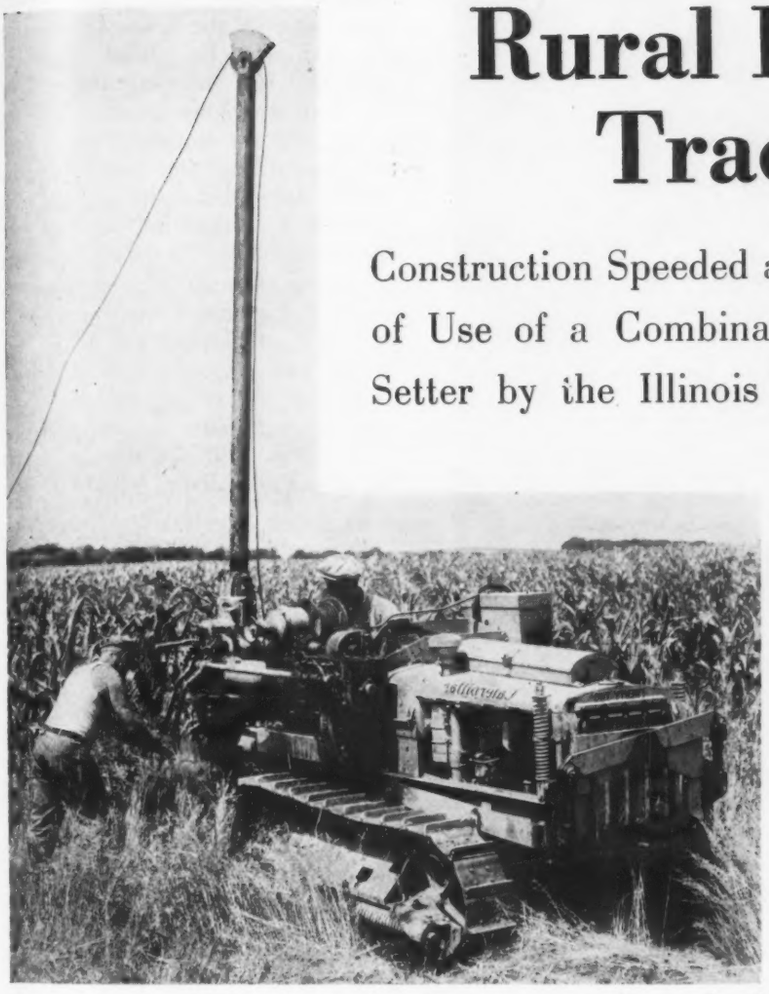


Control gap relieves over voltage flashovers

Longer time lag for rod and ring gaps and pillar insulators than for control gap. At 50 per cent overvoltage the control gap invariably is the one to flash over. To give comparable protection the rod gap spacing has to be practically halved.

Rural Lines—Tractor Built

Construction Speeded and Costs Reduced - Example of Use of a Combination Hole Digger and Pole Setter by the Illinois Northern Electric Company



This tractor digs a 5-ft. hole, sets the pole and moves to the next location in three minutes

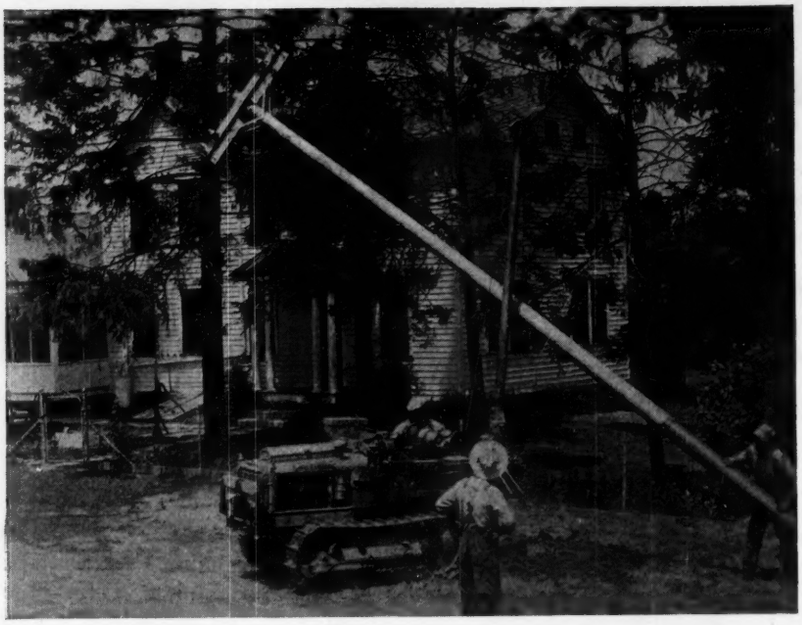
WITH the Rural Electrification Administration of the federal government having definitely allotted more than $14,500,000 for 111 rural projects in 32 states, the problem of bringing the myriad benefits of low-cost electric power to thousands of farm homes is now principally one of spending these funds in the localities and in a manner which will provide for the largest number of farms at the lowest possible cost. Already power companies, working independently and in conjunction with government engineers, have discovered new methods and new tools which have simplified and speeded up both survey work and actual line construction to such an extent that new low-cost standards are being set up for this type of work.

Outstanding achievements in these fields are the enlistment by the electric power industry of two modern representatives of the present mechanical "Age of Wonders," the airplane and the track-type tractor. Both have been adapted to specialized tasks in the work of rural electrification in a manner which pays tribute to the ingenuity of present-day electrical engineers. Such striking results in the elimination of hours of expensive and back-breaking work have been achieved that the industry's "old timers" shake their heads in disbelief at seemingly impossible tales of making a complete survey of more than 400 square miles of territory in fourteen hours, or of digging holes for, setting and aligning 100 poles over 3 miles of territory in a single eight-hour day with a crew of eight men and one specially equipped tractor.

A recent issue of ELECTRICAL WORLD carried a detailed report of an aerial survey conducted in Polk County by the State of Oregon Hydro-Electric Commission in which four plane flights totaling fourteen hours of flying were sufficient to survey with astounding accuracy an area of 410 square miles at a cost of less than $55,000, including salaries. Overlapping aerial photographs of every foot of ground in this area were taken in this short time, and when the resulting photographs were assembled into mosaics a survey map far surpassing charts made by old survey methods, both in accuracy and detail, was obtained. With these photographic maps an engineer sitting at his desk can draw up an accurate and fully comprehensive report of the work and expense required to bring power to that area.

Development of line tractors

Now we shift to the actual job of erecting the power line itself. The last five years have seen great progress in the development of tools to speed up and simplify the task of digging post holes and of erecting the poles themselves. Power-driven augers mounted on trucks were the first improvements in this field. It was a simple step to use the boom which housed the auger shaft as a crane arm for raising and setting the poles. But, revolutionary as these units were, they were practical only for work on comparatively level ground. When survey stakes called for a pole at the top of a steep hill which no roads traversed, or when a deep run-off ditch lay between the road and the spot where the hole was to be drilled, this unit was impractical. In the case of the inaccessible spot, old hand methods had to be used, and in the case of the intervening ditch much valuable time was lost in blocking and jacking the unit into proper digging position. There was also the danger of damage to adjoining farm property and private fences along the



This tractor sets 2.5 to 3 miles of poles per day and uses 1.75 gal. of gasoline per hour

right-of-way. The drilling units were large and difficult to maneuver, so that often several feet of fence had to be removed to make room for the truck. All of this took time and cost money, but so great were the savings effected by the other features of these units that field results still brought smiles to the faces of office engineers and executives.

But designing engineers were not satisfied. They looked for a more mobile, more compact and better-balanced unit to carry drilling and erecting tools. And, strangely enough, they found it on the very farms to which they were bringing this new low-cost power. They found it in the machine which had a hand in building the roads on which truck units were compelled to travel.

However, generalizations fail to tell the story of this machine as well as actual results and costs of operation as compiled by the foreman in charge of one of these units working in northwestern Illinois for the Illinois Northern Electric Company.

Track-type tractor the answer

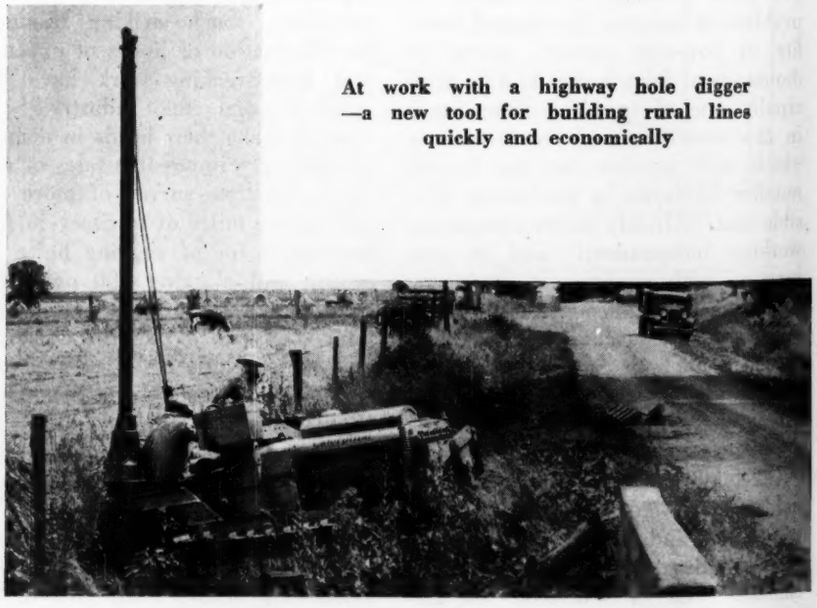
This crew of eight men and one tractor-mounted auger and erection boom were seen setting 25-ft. poles at 150 to 200 ft. intervals along 6 miles of right-of-way near Mt. Morris, Ill. The crew was so well trained that all lost motion was eliminated. In fact, when operations were clocked, it was found that this outfit was moving into position, setting the boom vertically, digging a 5½-ft. hole, raising the pole and setting it into the hole, and moving on to the next location in an average time of three minutes. On this particular job the foreman's figures showed that they were setting between 2½ and 3 miles of poles per eight-hour day.

The tractor unit was purchased new and began work on April 15 of this year. Since that time it has worked approximately 700 hours without serious mechanical difficulty and has set more than 5,000 poles over all kinds of ground during this period. Some idea of the cost of operating this unit may be gained from the operator's fuel consumption records. The tractor engine supplies all the power both for moving the unit over the ground and for propelling the drilling auger and operating the erection winch, power for the last two operations being supplied through the power take-off. This engine consumes in this type of work an average of 1¾ gal. of gasoline per hour. Delivered cost of gasoline in this area, excluding deductible taxes, is $0.113 per gallon, which means that the total fuel cost of operating this unit for an eight-hour day is only $1.58.

A Mile for $525

Perhaps a clearer conception of the savings effected by the use of this new unit can be gained from the statement of the foreman. "My gang is setting a mile of poles at a total cost of $525. This includes the cost of both labor and materials. Other gangs with which I am familiar, using old methods, are spending $500 per mile for erection alone, and this does *not* include labor or materials."

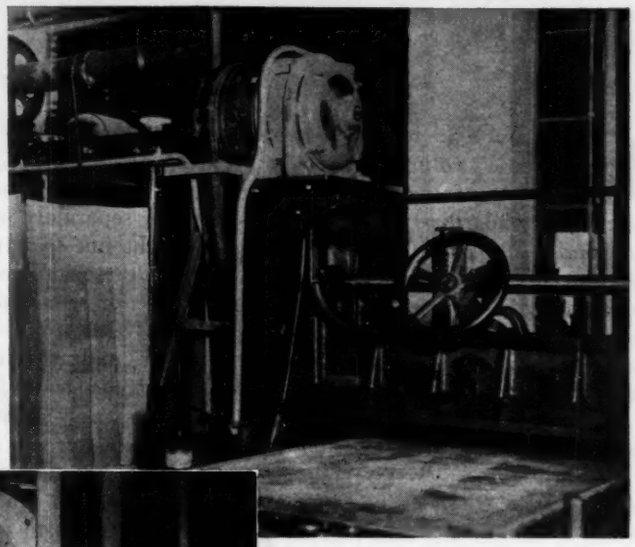
In this, we have an outstanding example of industrial co-operation. A farm machine, and farming is most certainly an industry under modern methods, lends a hand to another industry which is bringing the farmer the benefits of electric power, thus, in a sense, exchanging one cost-cutting power idea for another to the benefit of all concerned.



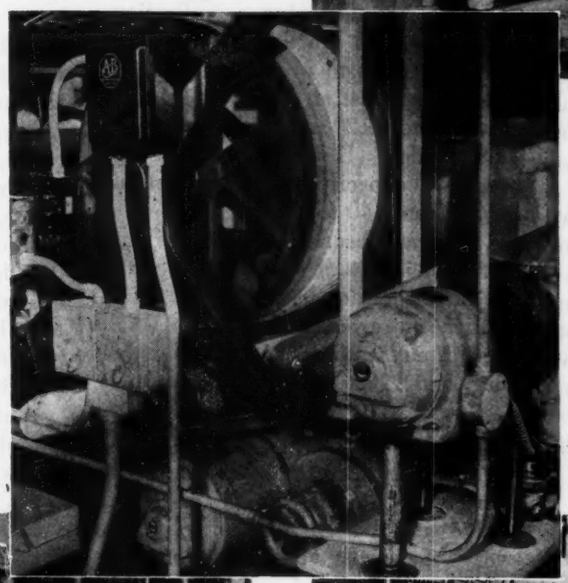
At work with a highway hole digger —a new tool for building rural lines quickly and economically

Induction Motors Provide Flexible Drive

WHEN the Boston Envelope Company moved into a new plant at Dedham, Mass., recently, it completely modernized the motor drives of its machinery, installing both variable-speed and constant-speed units. This enabled full advantage to be taken of production line routing, concentrated controls at operators' positions, eliminated troubles from oil and dirt falling on d.c. motor commutators, conserved space, adapted power to individual machine needs and safeguarded employees and stock against fire and accidents. The factory produced 20,000,000 envelopes in a recent month, or 2,000 envelopes per kilowatt-hour total service. Power-factor betterments are planned to increase the output ratio materially in terms of power cost. "United States" motors and "Allen-Bradley" control comprise the bulk of the new driving units.

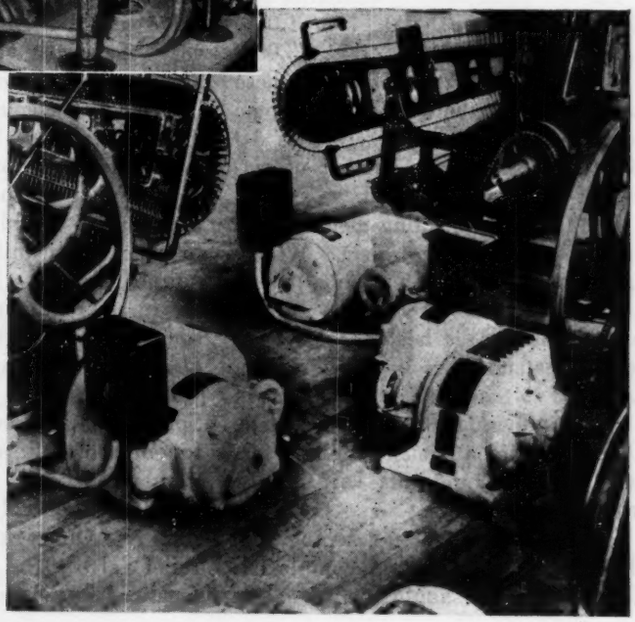


ROTARY ENVELOPE MACHINE, variable-speed motor drive, 2-hp., hand-wheel speed adjustment without steps, facilitating maximum production for particular stock processed. Gas blower fan at right center, ¼-hp. constant-speed motor direct connected, supplies hot air for drying wet gummed flaps in transit on looped conveyor.

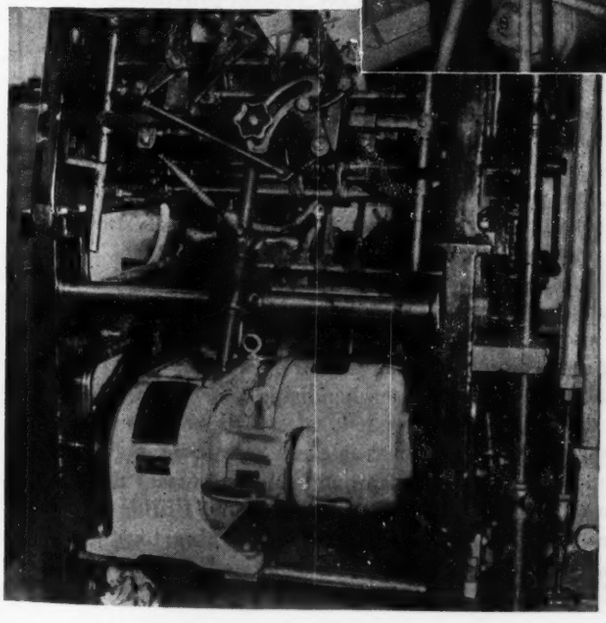


DIE PRESS, 14½ strokes per minute, belt-driven 3-hp. constant-speed motor and equipped with flywheel. Cuts 500 sheets per stroke to proper envelope size and shape. A ½-hp. reversible motor drives a stock elevator serving the press. Both motors are mounted high, utilizing space of little other value.

UNIT OF FOUR SMITH ENVELOPE MACHINES, capacity each, 7,000 per hour. Each machine is chain driven from a ¾-hp. variable-speed motor. Machines are set with motor drives on floor in intermediate space unused by operators; right-angle mountings enable units to be placed advantageously for employees and production from feeding and delivery standpoints. Drives well isolated from stock in process, which must be kept clean at all times to avoid spoilage.



"HARRIS" PRINTING PRESS, ¾-hp. variable-speed drive, with motor inside frame and handwheel convenient for operator. Automatic shut-down if stock jams. Press capacity 15,000 impressions per hour in two colors. Formerly belt driven from d.c. motor; new layout utilizes chain drive, no slippage, compact set-up and sustained production. Formerly had trouble from oil falling on belt and commutator. Motor bolted to flat strips and frame, compactness of variable-speed driving mechanism facilitates adjustment along horizontal axis.



Standardize Water Heaters

Present Specifications Call For Specialized Production With Excessive Costs—Why Not Agree on Some Degree of Standardization?

By L. W. W. MORROW
Editor ELECTRICAL WORLD

ONE WAY to reduce costs and increase volume in electric water heaters is to get a greater degree of standardization in specification and manufacture. Less than 15 per cent of the present production can be regarded as something approaching standard. The remainder has a variable combination of special requirements.

Water heaters cannot now be "packaged" or put on a production line. There are more than 20 tank sizes, ranging from 3 gal. up to 148 gal. in capacity, despite the fact that 80 per cent sold are in two sizes only. Tanks are made in galvanized, non-ferrous and alloy metals and the inventory for tanks alone is a heavy burden.

Wattage specifications are also variable. Some are based upon opinion, others upon empirical data and others on guesses. Many call for so many watts per gallon of tank capacity, which introduces the tank size variable. If all specifications are met, heating units must be of variable watt ratings, and this introduces further manufacturing and inventory costs.

Fairly established standards in heating units are: 500, 750, 1,000, 1,250, 1,500, 2,000, 2,500, 3,000, 3,500, 4,000 and 5,000 watts. If these were specified there would be some simplification, but even here it is desirable to reduce the number of ratings if economy is desired.

But tanks and heating elements are only a part of the problem. Wiring specifications are also variable. Some utilities require three wires to be brought out of the heater, some want four wires and others want the wiring arranged so that both units will cut in as their individual thermostats dictate. Others require a demand-limiting feature so that both units will not be used simultaneously.

These features are not wrong, but they do add to cost and complexity. This condition should permit some larger measure of standardization. One manufacturer, for example, suggests that each heating element be wired separately and four leads be brought out to a type of thermostat where the change of a single terminal connection would permit demand limiting. This would simplify manufacturing and stocking problems and permit the water heater to be connected in any desired manner.

The matter of thermostat settings adds to manufacturing complications. It is a general practice on the part of manufacturers to produce thermostats that may be set at any point from approximately 120 to 130 deg. up to 190 to 200 deg. However, some utilities are still specifying limited adjustment from 140 to 165 deg.

It seems reasonable that where there is a possibility of sealing the opening of these thermostats they could standardize on a calibration that would permit any setting between 125 or 130 deg. and 190 to 200 deg.

Relief valve variations

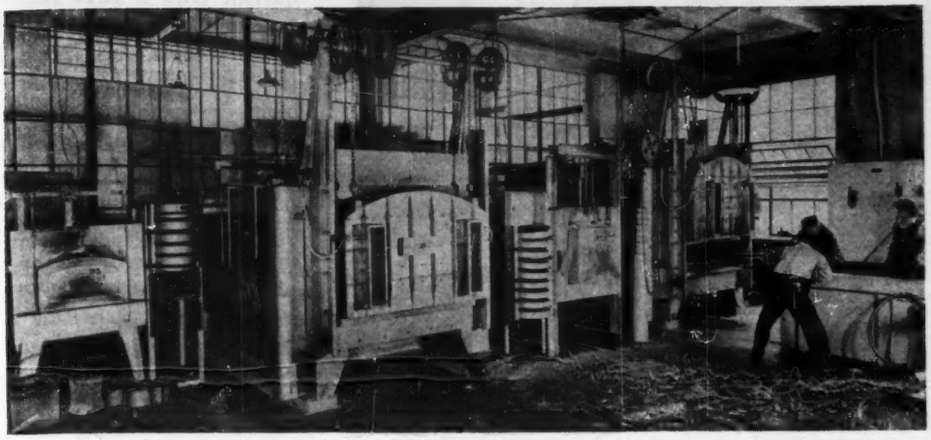
A further disturbing element is the variety of specifications on relief valve installations. Utilities could very materially assist in bringing about some sort of general standard in local requirements as to the type of relief valve desired, namely, either temperature, pressure or vacuum, or a combination of these, and, secondly, they might establish something approximating a uniform method or requirement for the installation of these valves. As the situation now stands, some utilities require a combination of temperature and pressure relief valve installed in the hot water line. Some want it installed directly in the top of the tank, and some require a nipple attached to the top of the tank and the relief valve installed in this nipple. Other utilities require the relief valve to be installed at various locations in the side of the tank. All of these variations mean special heaters, at increased costs, thereby upsetting normal production schedules and eliminating the possibility of progressive assembly.

Test costs excessive

Another point, although not strictly a production problem, is one which is expensive to the manufacturers. That is the matter of the test procedure which some power companies have set up. Some have admitted frankly that they do not know exactly what to look for in determining proper test methods, and, as a result, manufacturers have been called upon to run a great variety of tests in accordance with varied specification requirements, many of which do not hold any relation to established procedure, and thus frequently making it necessary to change manufacturing operations materially in order to meet some test requirement that frequently is neither practical nor good design.

A multiplicity of specifications and combinations for wattage requirements, for combinations of heating units, for various provisions, for relief valves and special wiring specifications, in addition to tanks of both galvanized and non-ferrous metal in many sizes, may and do reach mathematical equations that are astounding. This means that, beyond a certain point, each water heater order becomes a specification job and must be handled and routed as such.

Electric water heater sales have shown a remarkable increase in the last few years, and the indication is that as lower rates and more intensive merchandising campaigns are extended sales will continue to climb. But as these sales continue to mount, manufacturing becomes more of a complex problem. Utilities and manufacturers, by getting together, could be of tremendous benefit to each other in standardizing on specifications.



Electric heat treating strengthens airplane parts

Here are the hardening and air draw furnaces which form part of the equipment of the Boeing Aircraft Company's modernized heat-treating plant. The large oil bath is seen in the right background.

Buys Electric Furnaces for Treating Airplane Parts

With the heat-treating processes in its plant completely modernized, the Boeing Aircraft Company, Seattle, Wash., is now in production on thirteen giant four-engined Model 299 bombers for the United States Air Corps, with deliveries scheduled to start this fall. Identical in all major respects with the initial Boeing 299 which flew non-stop from Seattle to Dayton, Ohio, at an average speed of more than 232 miles an hour last year, the "flying fortresses" rank as America's largest land planes and as the fastest, longest range bombers ever built. In the commercial field the company is represented by its high-speed twin-engined transports, which today are flying 50,000 miles or the equivalent distance of twice around the world every 24 hours in the service of United Air Lines and other operators.

By E. P. DEAN

Plant Engineer Boeing Aircraft Company, Seattle, Wash.

FACED with the need for more modern and adequate heat-treating facilities, the Boeing Aircraft Company has installed what is declared to be the most up-to-date heat-treating plant of its kind on the Pacific Coast. The new installation, representing an investment of about $20,000, is scientifically arranged and equipped to give the many large and small steel parts of the Boeing all-metal plane precision handling in minimum time.

The equipment includes hardening and air draw furnaces and gas atmosphere controller furnished by Hevi Duty, two Hoskins furnaces for both hardening and drawing, three Eclipse pot furnaces, a large oil bath, a small oil bath, a water quench tank, a gas muffle furnace, a large cleaning tank, a power distribution panel and a control panel.

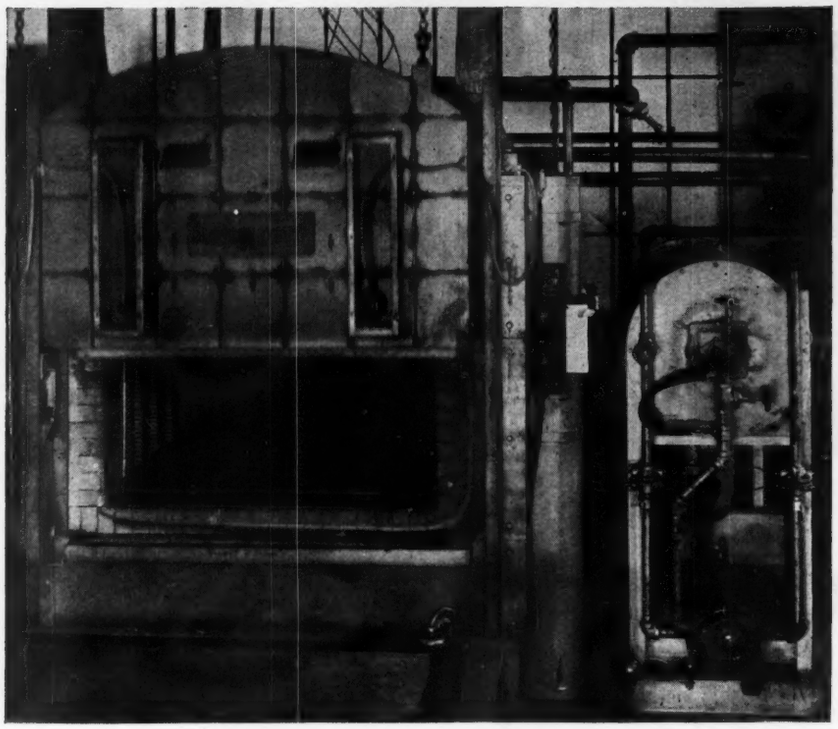
With these facilities the Boeing company is able to heat treat parts as much as 4 ft. wide, 10 ft. long or 2 ft. in thickness. Three men on one shift now accomplish more work than formerly was handled by four men on two shifts. Temperatures are precisely controlled, with automatic checks against overheating or underheating. The gas atmosphere controller so regulates the atmospheric content of the hardening furnace that there is neither scaling nor decarbonization of parts, with the result that virtually all former pickling and sand-blasting operations have been eliminated.

Separate room for equipment

The entire heat-treating plant, operating as a unit of the Boeing company's machine shop, is housed in a room 39x40 ft. Equipment is ranged around the sides, leaving ample floor space. An exhaust fan on the roof removes smoke and fumes.

The Hevi Duty hardening and air draw furnaces each have interior dimensions of 4 ft. wide, 8 ft. long and 2 ft. high. One of the Hoskins is 20 in. wide, 10 ft. long and 1 ft. high on the interior; the other is 20 in. wide, 6 ft. long and 1 ft. high. The gas atmosphere controller, which operates in conjunction with the Hevi Duty hardening furnace, has a capacity of 1,400 cu.ft. per hour. Of the three pot furnaces, one is for hardening and a second for drawing. Each has a 10x16-in. pot. The third, used for cyanide hardening, has a 14x16-in. pot.

The large oil quench tank has inside dimensions of 5 ft. wide, 11 ft. long and 32 in. deep; the small oil bath, 3 ft.x3 ft.x32 in. and the water



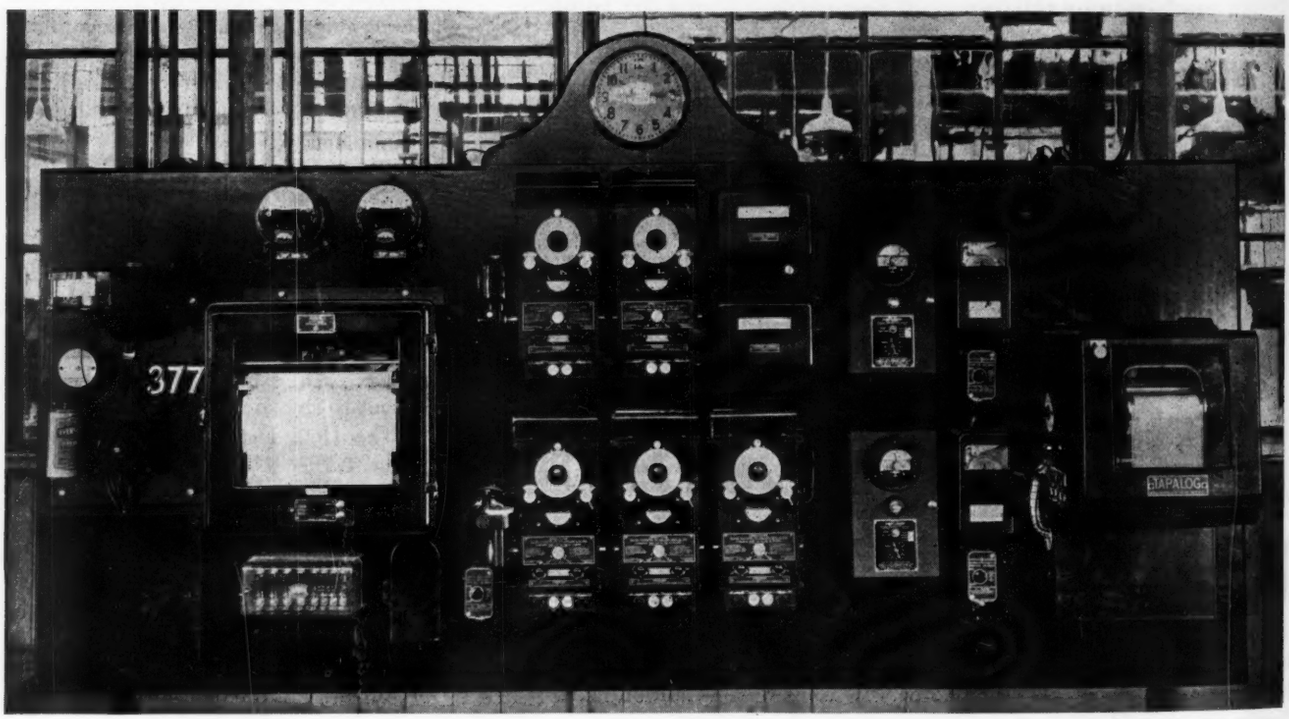
Controlled atmosphere for heat treating

One of the large hardening furnaces. Gas atmosphere control at the right.

quench tank 2 ft.x4 ft.x21 in. The gas muffle furnace, used for heat-treating tools, has inside dimensions of 8 in. wide, 1 ft. long and 4 in. high.

Treats steel and aluminum alloys

With the tensile strength of structural steel parts frequently being doubled by the heat-treating method, this plant occupies an important place in the factory set-up of the Boeing Company, particularly with the trend toward increasingly large planes and the consequent use of more and larger steel parts. Materials heat treated at the Boeing plant include chrome molybdenum SAE 4130, chrome nickel molybdenum SAE 4345, nickel steel SAE 2330 and carborizing steel SAE 2515. The company also uses its heat-treating equipment for the annealing of both 17 and 24ST aluminum alloy sheet. Parts heat treated include spar chords, also cylinders, gussets, landing gear parts, struts, trunnions, bolts, fittings of all kinds, and tools.



All conditions for treatment are controlled here

The control panel, with its many switches and recording instruments, measures 7 ft. high and 9 feet long, over all. Among devices on it are a Wilson-Maeulen indicating pyrometer with a 20-point switch, by means of which temperatures of any one of the furnaces or pots can be read on the one instrument; a Foxboro potentiometer recording pyrometer which automatically maintains a continuous temperature record of the hardening, air draw and 10-ft. Hoskins furnaces; five Foxboro potentiometer control pyrometers which maintain automatic temperature control of the hardening, air draw and 10-ft. Hoskins furnaces; two Lindberg input control instruments which regulate the rate of heat input to the hardening and air draw furnaces; two Hevi Duty temperature cutouts which protect the hardening and air draw furnaces against overheating in the event the control pyrometers fail to function; two General Electric time switches and one Tork clock switch for turning the hardening, air draw and 10-ft. Hoskins furnaces on and off at predetermined times; a Wilson-Maeulen Tapalog recording pyrometer, used in connection with the pot furnaces, 6-ft. Hoskins furnace and gas muffler furnace; a General Electric clock, and two power meters showing the kilowatt-hours of power consumption.

Utility Pace Speeds Up

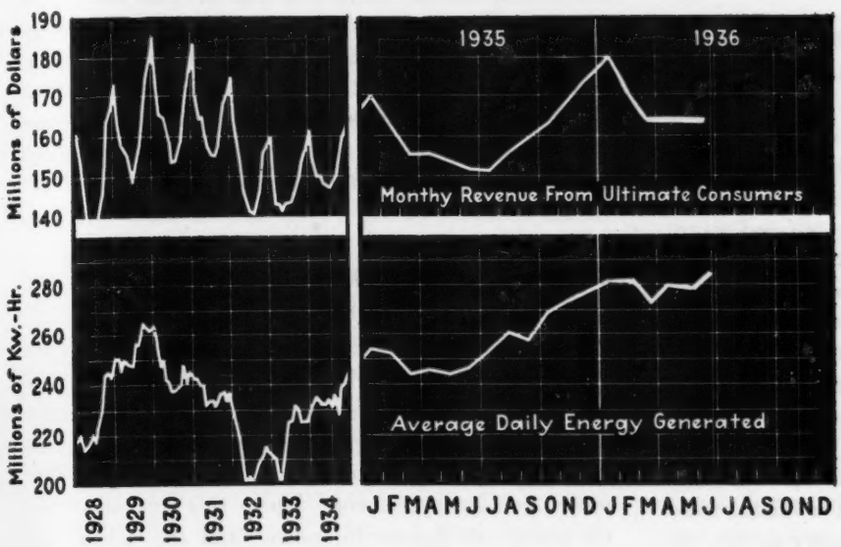
Revenue and Output Set New June Records — Revenue 8.3 per cent and Output 15.4 per cent Above 1935

PREVIOUS records for the month were surpassed by a comfortable margin when the revenue of the electric light and power industry in June rose to $164,007,200, according to the Edison Electric Institute, and energy production advanced to 8,560,600,000 kw.-hr.

The income exceeded that of a year ago by 8.3 per cent, the largest gain since the late twenties. In March and April the revenue was approximately equal to that of 1930, the year of greatest revenue. In May the 1930 record was topped by 1.6 per cent. and in June by 3.8 per cent.

Unfortunately, corresponding statistics are not available for operating expenses and taxes, and therefore no conclusions can be drawn regarding the increase in net earnings.

In contrast with the increase of 8.3 per cent in revenue from ultimate consumers, energy production was 15.4 per cent greater than in June of 1935, while the gain of less than 4 per cent in revenue over 1930 required an increase of 18.7 per cent in kilowatt-hours produced. The average daily production of 285,000,000 kw.-hr. was the largest for any month in the history of the industry.



Huge increase in steam load

Widespread drought conditions are reflected in the data on energy generated from water power. This decreased almost 8 per cent, compared with a year ago. It constituted only 35 per cent of the total production, against 43 per cent in May. As is evident from Table II, the reduction was widespread; only the far West shows an increase over June, 1935. As a consequence, production from fuels increased 14 per cent over May and 33.5 per cent over a year ago. The figures for the East South Central states omit energy from Muscle Shoals, not viewed as a public utility. If that item is included the region shows an increase of 5 per cent in total production over 1935.

In the allocation of energy by classes of consumers the most striking feature is the year's increase of 23.6 per cent in the large commercial group to a new all-time peak for any month. Average annual domestic use increased 7.6 per cent to 697 kw. hr. per customer.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1936	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
June	164,007	+8.3	8,560	+15.4	2,987	— 7.9	5,573	+33.5
May	164,015	+7.1	8,604	+14.0	3,702	+ 5.3	4,902	+21.2
April	165,703	+6.2	8,422	+14.2	3,802	+11.0	4,620	+17.0
March	165,650	+6.3	8,434	+11.8	3,591	+ 5.7	4,843	+16.5

Table II—Regional Revenue and Energy Output in June, 1936

Compared with Corresponding Month of Previous Year

Geographical Regin	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	164,007	+ 8.3	8,560	+15.4	2,987	— 7.9	5,573	+33.5
New England	13,836	+ 7.3	550	+11.1	198	—26.9	352	+57.1
Middle Atlantic	45,820	+ 4.7	2,081	+13.8	485	—11.8	1,596	+24.8
East No. Central	37,384	+ 8.3	2,005	+19.7	152	—25.1	1,853	+25.9
West No. Central	13,911	+ 9.8	570	+ 5.7	144	—33.6	426	+32.3
South Atlantic, East So. Central	21,518	+14.4	1,051	+28.8	437	— 3.9	614	+70.5
			317	—10.2	217	—29.8	100	+126.0
West So. Central	9,452	+14.2	471	+24.2	11	—62.3	460	+31.4
Mountain	5,197	+ 9.4	351	+24.9	290	+23.4	61	+31.0
Pacific	16,989	+ 7.3	1,164	+11.1	1,053	+ 8.3	111	+47.8

* By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
† Preliminary, Edison Electric Institute.

Table III—Allocation of Energy June, 1936

Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	8,640	+16.7
Lost in transmission, etc.	1,376	+ 9.5
Sold to ultimate consumers.	7,264	+18.2
Domestic	1,144	+ 8.0
Com'l, small light and power.	1,275	+16.4
Com'l, large light and power.	4,197	+23.6
Municipal street lighting	159	+ 4.4
Railways—street, interurban	346	+ 4.5
Railroads—electrified steam.	75	+14.6
Municipal and miscellaneous.	68	+41.1

* Generated, purchased from other sources, imported, less energy used in railway and other departments.

Editorials

L. W. W. MORROW . EDITOR

To Discount Attacks, Go Ahead

OUR utilities have been definitely committed to the policy of abundance for years. While the costs of other commodities and services have been standing still or climbing upward, the cost of electric service in every form has been sharply decreased. With each decrease the field of application of electric service has widened. Further, that particular policy is being pursued more thoroughly today than perhaps at any other time in the history of the industry, and the utilities will stand or fall, dependent upon whether that policy and that economic doctrine turns out to be sound or specious. Those who have studied the problem for many decades believe that the utilities can well afford to commit themselves to the limit to that policy.

At the present time, with the country emerging from the deepest depression known after a valiant five-year struggle, one finds the people of every section of the United States eager for more goods of every kind. With the desire for more goods and for more abundant living goes a need and a desire for more electric service. The steady and ever more accelerated climb of the curve of electric power production gives conclusive evidence, if further evidence is needed, to this desire for more electric service. In many cases this has meant extending existing electric facilities, perhaps not to the limit, but very close to the limit. Nevertheless, and in the face of all this, one finds a tendency to hesitate in the proceeding with plans for expansion. The reason? The coming elections.

It must be granted that the results of the coming elections are going to have a vital influence on business in general and on the utilities in particular. The harassing which the utilities have been subjected to within the last four years will undoubtedly continue if the present Administration should be given another grant of power for four years, and, for some of the utilities, this may make extremely hard sledding. But it is our belief that the present business revival, in spite of the numerous thwarted attempts made to throttle it over the last four years, will continue regardless of the election outcome. It appears reasonably certain that electrical output will, in spite of any possible unfavorable election results, continue to climb, although, in all probability, not as steeply as it will under a favorable election result. But the vitality of the electric utility industry is too great to be extinguished, even by an extension of the New Deal.

In the light of all the above, a wise policy for the utilities to follow should be based on sober optimism. Sales should be pushed in domestic, commercial and power fields. If systems, as a result of such sales activities, are going to be loaded to the limit, expansion should be undertaken in generation, transmission, distribution and service facilities. But let the utilities sell more of their service, and as they cut costs let them sell still more service. If that policy is followed it is inconceivable that even politicians will not eventually become reconciled to the idea that the best thing they can do, in a situation where utilities perform the magnificent job that the American systems are performing, is to let them continue to do the job without harassing them. Eventually, this is bound to happen. Who knows but that some day they may not only be left alone but actually given a little encouragement?

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Promise Compromise on T.V.A.

THE President has called a conference to study the possibilities for working out a power pooling agreement for T.V.A. and Bonneville. Washington dispatches, for the first time, show that the government is apparently willing to work out an economic and co-operative power pooling agreement. Up to this time there was no policy on Bonneville power and the T.V.A. had refused to negotiate with private utilities recently. Report has it that Dr. A. E. Morgan, Basil Manly and others have obtained a hearing in high quarters and brought about this conciliatory conference.

These federal projects are built or are under way. They produce power. In the public interest it is advisable that this power be used to best advantage in the regions where it is produced. Existing private utilities in these areas are the logical agencies to buy and distribute this federal power. They have offered to do this in the past, but without avail. Now there is a prospect that a deal will be made.

It is high time that uncertainty be removed from the policy aspects of these federal power projects. There should be a uniform plan announced and followed for the disposal of the power. Private utilities cannot refinance, cannot build capacity and cannot plan expansion programs while threatened by cut-throat competition from federal power developments that have no limits or bounds. This is one reason for the host of court cases now recorded.

These suits will be pushed despite the Washington conference because these federal projects involve con-

stitutional questions. But the invitation to the conference and the omission of several "yardstick" theories in the invitation indicate that federal authorities are now willing to compromise in their heretofore ardent endeavors to put private utilities out of business. We hope this conference will have constructive results and that both parties will participate with the determination to work out a fair and practical plan for power pooling and power development.

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Co-ordinate Generating Plans

THE astonishing load-climbing records being made almost weekly by the utility systems of the country have brought forth a great deal of power system expansion. This is particularly true as regards generation facilities. An outstanding fact in connection with this capacity expansion is that it will take one of two forms: (1) Superposition, and (2) expansion of old plants, with superposition leading by far in volume. This trend is bound to continue until the old steam plant sites have been modernized and extended to the new economic limits opened up by the advances in steam plant technology over the past six or seven years.

Now the outstanding fact in connection with superposition is that as a general rule it has to be handled in fairly large blocks if the job is to be done in the most economical manner from an investment standpoint. This, however, in turn brings with it two principal disadvantages: First, it involves a fairly heavy capital investment and, second, it requires load of very high load factor to give maximum returns and even a justification for the investment. Such a load and load factor may not exist on any one particular system that is considering superposition.

The solution for such a difficulty lies in the co-ordination of the generation expansion programs of neighboring systems. By such co-ordination it will be found possible to stagger construction schedules between the co-ordinating groups and thus not only ease the burden of capital costs but, what is equally important, make possible the fullest use of the new and efficient equipment. To carry out such a co-ordination of expansion programs may, it is true, call for strengthening of the interconnection facilities between the two groups proposing the co-ordination, but that should not act as a barrier. As a matter of fact, it should be welcomed as an opportunity for closer integration and co-ordination of neighboring utility systems on an economic basis.

Assuming that such opportunities for closer co-ordination exist, it is hoped and urged that there be no hesitancy and delay in bringing these to fruition. There should be no standing on false ceremony. Far too frequently any attitude of that sort results in co-ordination remaining in *status quo* and continuation by each group of "paddling its own canoe." But that is obviously neither in the public nor any individual group's interest. This has been amply demonstrated in the scores of cases where voluntary co-ordination has taken place. But the present times present an unusual opportunity for continuing and extending that practice. The beneficial results of such co-ordination are indisputable. For it will yield lower costs, better interconnection and, therefore, better preparation for emergencies and better service. Finally, it will act once again as a demonstration that the utilities of this country can and do look beyond narrow corporate interest and that they are capable of continuing to carry on the task of integration and co-ordination without the help of catalytic or other agencies.

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The Key to Commercial Cooking

BACK TEN YEARS the power industry had high hopes of building up a large and profitable commercial cooking load. Hotels, restaurants and club kitchens use a lot of heat. Electric ranges appeared to offer a degree of control and an improvement in working conditions superior to coal and gas fuel. The market looked promising. But it did not work out.

Today utility sales departments pay little attention to these once-alluring prospects. Few manufacturers are making commercial electric ranges. Hotel and restaurant men are not hearing much about electric cooking any more. What went wrong?

It was the selling that failed, not the electric range. The industry made the fatal mistake of sending out men who talked about electricity to people who thought only in terms of food. They might as well have spoken Spanish to Russians. These chefs and managers did not understand. They were not interested. They did not believe. So naturally they did not buy.

A man who runs a restaurant has his mind set on one thing or he does not run it long. He is concerned with the purchase, preparation, cooking and serving of food. He is perpetually involved in the management of chefs and kitchen help, who work at top speed, under high pressure, in intense heat and are temperamental. He must constantly watch his costs. And when these electrical men tried to sell him kilowatt-hours and a new-fangled range and showed that they knew nothing of the practical problem of running a kitchen, the hotel man turned his back.

Some day the power companies and the range manufacturers will hire a few kitchen experts and this load will go on the lines. These men will know cooking costs and why chefs blow up and quit and why restaurants fail. They will get a hearing in any hotel. And when they have sold enough of the leaders, the rest of the business will follow on its merits. For this market is just as good as it looked when hopes were high.

Lewis' Miners Eye Hydro

IT IS quite possible that the votes of coal miners will re-elect Franklin D. Roosevelt. Five of the seven states generally agreed upon as pivotal in this election have large numbers of coal miners who are being herded by John L. Lewis, in so far as he is able to deliver them, into the Roosevelt camp. These states are Pennsylvania, West Virginia, Ohio, Indiana and Illinois, all normally Republican, all doubtful this year, and no one of which, with the possible exception of Indiana, Landon can possibly lose and still be elected.

Which brings to mind the Bible story of Esau and Jacob. Esau, it will be recalled, was very hungry. Jacob was cooking a mess of pottage, but wouldn't give Esau any. So Esau finally traded his birthright for it. Probably the gnawing of his stomach seemed much more important to him at the moment than the far off future perquisites of a birthright.

Jacob's children became a great nation as a result of that deal, though the pottage which was the price of the birthright was soon digested.

The present analogy lies in the fact that no one realized the danger to coal miners of Roosevelt's passion for developing water power any more keenly than did John L. Lewis. No one was keener in pointing out the economic absurdity of much of the program, nor the selfish interests which were co-operating to aid it. And no one was more alive to the fact that while constructing such water-power developments would provide employment for a short time, the net result would be to increase unemployment, especially among the coal miners, from then on.

LET'S look at Mr. Lewis' views, vigorously expressed at an NRA meeting on March 1, 1934, long before he smelled the savory aroma of the Guffey bill pottage. Mr. Lewis on that occasion was fighting for a high scale of wages for the miners. He made light of the contention that higher coal prices would result in resort to oil and other power sources. But he seemed distinctly worried about government subsidy to hydro-electric developments.

"What are the facts with relation to the hydro-electric development throughout the country?" he demanded. "The outstanding fact in connection with that proposition is that the development of hydro-electric plants to generate power to displace coal is no longer considered upon a basis of cost. The Tennessee Valley Authority was not authorized by Congress because electric power would replace coal upon any basis of cost. The Boulder Dam was not projected upon that premise. The St. Lawrence waterway is not to be built because electric power can be produced cheaper than electric power produced by coal. The Loup River project in Nebraska is not being promised because the power thus generated will be cheaper for industry than power produced by coal.

"Why, the Loup River project is being promoted by a group of about 150 individuals out in Nebraska who have hired a man to represent them in getting government money to finance the project, and from all reports he is to get either 10 per cent or 5 per cent of the gross amount that the government allocates. His interest in developing the Loup River project is to get his commission, and the 150 people who are promoting the project in Nebraska are willing to pay him a commission if the government will give them the money with which to pay his commission. A very simple proposition, and, by the way, Loup River project was surveyed repeatedly by private power enterprise and rejected as being an inefficient site for the development of electric power on the basis of cost of other projects and with coal.

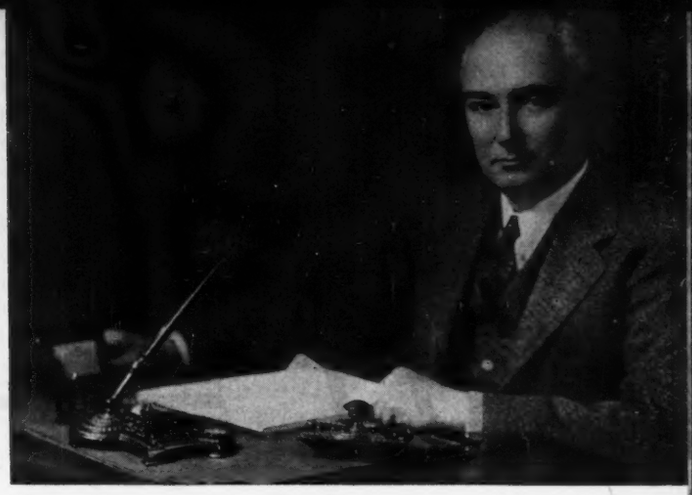
"SO IT amounts to the proposition that wide development in the generation of electric power through the construction of hydro-electric plants is not being done because the price of coal is too high and is not being done because the wages of the mine workers are too high. My distinguished friend Mr. Francis (J. D. Francis) in his address to this conference stated *what we all know to be true, that power can be generated from coal more cheaply per kilowatt-hour than it can be done through the construction of hydro-electric plants.* That is an *established scientific fact.* Yet for whatever reason, certain branches of the government are promoting the construction and development of vast hydro-electric projects.

"There is pending in the Senate at the present time a bill by Senator Norris of Nebraska to create a Missouri Valley Authority which conveys the right on that authority to construct hydro-electric plants at available sites on the Missouri River or any of its tributaries covering ten great states of this union, and about the only restriction is that they must build a dam on some point on those rivers where the water doesn't run uphill, and the bill proposes that the government of the U. S. shall write a blank check to finance those undertakings when surveys are made and approval is given those projects by the Missouri Valley Authority under that act.

"Certainly *such a policy is destructive of the interests of the coal industry.* Certainly it will restrict the productive capacity of the industry. Certainly it will *increase unemployment.* Certainly it is not a sound policy from our viewpoint *to destroy permanent jobs in America* and substitute for them only an equal number of *temporary* jobs, and that is what the hydro-electric power propositions amount to in their final analysis. The Loup River project will create for a limited length of time just about the same number of jobs that it eliminates in the coal industry and the railroad and distribution industries. We protest the policy. The coal industry is a unit in thinking it an unsound, uneconomic policy during a period when our country is struggling with the overwhelming and almost overpowering question of trying to provide employment for our wage earning population."

Mr. Lewis did not give any figures in this argument, unfortunately, but figures have been compiled. One authority estimates that the Roosevelt power

—By CARTER FIELD



This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.

program, carried all the way through, would *permanently* displace 80,000 miners. The same authority estimates that it would displace 40,000 railroad workers. This last figure may not necessarily be accurate. It is obtained from the old formula that it takes one railroad worker to haul the coal that each two miners produce. The location of steam plants for the production of power, however, might change this calculation. Especially if some economic method of producing power at the mine mouth should be developed.

BUT the natural and inevitable effects of multiplying hydro-electric plants, even if they are economically sound, would seem to be obvious to any coal miner and any railroad man. It takes about 15 tons of coal to haul a passenger train from New York to Washington. On that line the Pennsylvania Railroad operates about 40 passenger trains a day. So there is about 600 tons of coal a day of consumption permanently lost to the coal industry—and a very definite number of days' work lost to coal miners. Obviously the freight trains on this run would more than double the coal consumption of the passenger trains.

Recently ELECTRICAL WORLD told of the eagerness of the Federal Power Commission to get more stretches of railroad track electrified. But it is not so important what industry uses this surplus current which the government is so anxious to produce. If one doesn't, another will. And every time hydro-electric current is used coal-produced current is supplanted.

New Dealers dispute this. They say that new fields are opened up. New uses for electricity are developed. So far this argument is true. But they say that this additional use comes from the lower cost of hydro-produced electricity. That is *not* true if Mr. Lewis is right in his statement that electricity can be produced more cheaply from coal, even at high prices for coal, than from water power.

Mr. Lewis has not recanted from his statement since his conversion, after the Administration pushed through the Guffey bill. And no New Deal agency has ever dared to challenge it.

General suspicion, of course, is that Mr. Lewis really was not tricked into trading the birthright of the coal miners of this country for the Guffey bill pottage. Suspicion is that Mr. Lewis sees for Mr. Lewis personally something very important—so important that plenty of work for the coal miners in the future becomes almost trifling in comparison—that is from Mr. Lewis' viewpoint. This important something—for Mr. Lewis—is nothing short of the presidency of the United States on the labor ticket in 1940.

Pennsylvania, with its 36 electoral votes, is generally regarded as *the* pivotal state in this election. In one of these articles the whole electoral vote situation was discussed at length, the theory being that Landon *must* carry all of the coal states mentioned above, plus New York, New Jersey and Michigan. These, plus New England, would make it possible for him to win by picking up about 35 electoral votes west of the Mississippi River.

If we assume that Governor Landon makes a satisfactory farm speech—not delivered as this is written, but which was scheduled for Des Moines on September 22—there is little real doubt that more than 35 votes from west of the Mississippi will be obtained. Especially as Frank O. Lowden, the idol of the farm belt, has come out so strongly for Landon.

But it is virtually impossible for the Republicans to pick up enough electoral votes in the West to make up for the loss of Pennsylvania, or Ohio, or Illinois, of the coal-producing states. And the drift of the coal miners to Roosevelt and water power is clearly shown in the poll of all the registered voters of Maryland now being conducted by the Baltimore *Sun*. Normally heavily Republican western Maryland counties, where the coal mines are, are showing heavy Roosevelt leads. The same amount of shift would play havoc with Republican hopes in West Virginia and Pennsylvania.

RATHER a bad taste was left by the injection of the government ownership issue in the discussion of the World Power Conference. Not all of the criticism has been against the New Deal officials. Even such an anti-government ownership source as the Chicago *Journal of Commerce* rapped the knuckles of both the Administration and the private utilities for taking up so much time at the meeting on this domestic political issue. Actually the blame seems to the disinterested observer to be more on the Administration, not only actually, but because of the fear they had inspired in public utility circles that the New Dealers intended to use the big international gathering as a sounding board for domestic political purposes.

Incidentally much of the New Deal fire centered on state utility commissions, it being one of the premises of several Administration arguments that the public could not depend on such bodies to force the utilities to grant proper rate reductions.

News OF THE WEEK

President Calls Conference on Hydro Markets as Government's Power Program Faces Impasse

Three utility men among those invited to White House next Wednesday to solve market dilemma by joint use of generation and transmission facilities

With election day only six weeks away, with World Power Conference delegates journeying to their homes after turning thumbs down on the administration program of destructive competition with utilities, after utility spokesmen pointed out to delegates and to the public that no market exists for the government's vast hydro-electric projects, as Boulder Dam's largest prospective customer—Metropolitan Water District of Southern California—announces it cannot take its 36 per cent of Boulder Dam output before 1941, as three government commissions search for a market for Bonneville's output, as the major market for Norris Dam output threatens to disappear November 3, as "standstill" injunctions are sought throughout the Tennessee Valley area to blockade T.V.A. expansion, as guerrilla warfare breaks out in rural extension construction, came a ray of light this week as rumors which started in Knoxville the first of the month evolved into an announcement from the White House that three utility men were among those invited to a conference September 30 with President Roosevelt to discuss joint use of the existing transmission line networks and interchange of power.

The fourteen invited to attend the conference are as follows:

Wendell L. Willkie, president Commonwealth & Southern Corporation.

Preston S. Arkwright, president Georgia Power Company.

Samuel Ferguson, chairman of the board Hartford Eectric Light Company.

Owen D. Young, chairman of the board General Electric Company.

Russell C. Leffingwell of J. P. Morgan & Company.

Arthur E. Morgan, chairman, and H. A. Morgan and David Lilienthal of the Tennessee Valley Authority.

Frank R. McNinch, chairman, and Basil Manly of the Federal Power Commission.

Frederic A. Delano, vice-chairman of the National Resources Committee.

Morris L. Cooke, Rural Electrification Administrator.

Louis B. Wehle, New York attorney.

Alexander Sachs, research director of Lehman Corporation.

"I hope and believe that, with the co-operation of those interested," said the President's statement, "we will be able to work out a constructive plan that will extend to the Southeast and other great regions of our country the benefits and comforts that can be secured through proper development of our unparalleled natural resources."

Conference has great possibilities

As two adjectives in the above statement, "constructive" and "proper," may be interpreted by conferees around the table will depend whether utilities may at last expect a square deal from the New Deal or, as metropolitan dailies express it, find only a "mere campaign gesture" in line with the President's latest plan of calling in representatives of many lines of business.

Despite the fact that the conference concerns primarily only the continuance of a market for Norris Dam power, and despite the fact that the three utility men are outnumbered at the conference, the utilities are going in to the table with a handful of aces. The eyes of the industry will be upon them. For such a conference was urged by ELECTRICAL WORLD in its leading editorial on May 9, the idea was subsequently broached in highest governmental circles, and was spurned before June 6.

That the idea has now been picked up again, dusted off and given a presidential paternity means that the conference should possess great possibilities.

Candid camera view

A candid camera view emphasizes this opinion. Announcement was made last month (ELECTRICAL WORLD, August 8, 1936, page 5) coincident with test runs on Norris Dam, that the present contracts would expire in three months, thereby canceling a territorial truce and interchange agreements affecting Commonwealth & Southern, Alabama Power Company, Tennessee Electric Power Company, Georgia Power Company and Mississippi Power Company.

A few days later the President was telling a press conference that there was a power shortage in the T.V.A. area, a statement that was vehemently denied by utility spokesmen, who pointed out that privately owned com-

panies had ample capacity, that the real rub was where would the government market its 600,000 kw. of T.V.A. hydro-electric "incidental" power.

Difficulties are mounting

At the present writing it appears that the utility representatives will accept the invitation, though obviously with fingers crossed, and, in truth, with heads bloody but unbowed —unbowed from the moral strength imparted by the possession of a handful of aces.

Fingers will probably be crossed because nary a single Electric Bond & Share adept will gather in the conference anteroom despite the fact that ten associated Bond & Share operating companies are directly affected by federal power projects.

A second reason for crossed fingers is that federal power officials are working their heads off to prepare their own conceptions of "power pools" for submission at the conference. These should keep all parties concerned busy on conferences until after election.

Thirdly, fairminded Arthur E. Morgan, chairman of T.V.A. and a member of the conference, has already published this week his views of what agreements must be reached at the conference.

His first point, and one on which the conference may stall, involves recognition that electric power supply is a business in which public as well as private companies may properly engage.

His second point, innocuous enough, states that "the power issue" will best be solved by direct negotiations and by co-operation rather than warfare.

The third asks for "active and fair competition" with "real and dependable yardsticks" and this may mean long argument when the present futility of dishonest yardsticks is remembered.

At best, the utility people will enter upon a thankless, difficult job for the public utility industry, but developments of the conference will probably be as interesting as a Supreme Court decision.

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Go-Modern Campaign Concluded by Florida Power

Florida Power & Light Company has just concluded a thirteen-week Go-Modern campaign in the interests of electrifying the kitchen. Although June, July and August are supposed to be the quiet months in Florida, this utilities-dealer co-operative program resulted in the installation of 8,654 major appliances. Of this number 5,611 were sold in the southern division, which includes the Greater Miami area. Considerable co-operative advertising was done in local newspapers by dealers and utilities.

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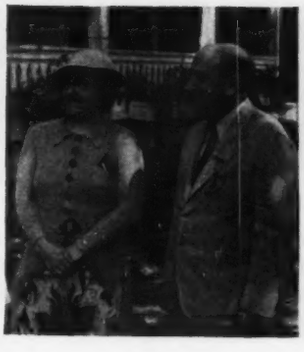
Companies Receive Barton's Praise

"You have done a fine job with your Better Light - Better Sight campaign" Bruce Barton told 100 utility company officials Wednesday gathered at New York's Waldorf-Astoria. "You have taken an idea to which the public was apathetic and made it live and interesting. When I hear you talk of two million I.E.S. lamp sales for October, I can't help but think of only two years ago when we were trying to get department stores to take on I.E.S. lamps. Your progress is just the beginning of what you can do in the future."

The occasion was a luncheon tendered by General Electric to light and power company heads in and around New York. Instead of playing their usual rôle of preaching better lighting the utility people sat in the audience and heard it preached.

A résumé of why lighting merits a number one position in the utility sales program was offered by charts, demonstrations and a small scale lamp exposition.

AS PENNSYLVANIA ELECTRIC ASSOCIATION CONVENED AT BEDFORD SPRINGS



Utilities Challenge "Validity" Ruling

Briefs filed in T.V.A. litigation maintain issue of validity is not linked with question of jurisdiction

Constitutionality of T.V.A. does not enter into the question of the jurisdiction of the federal court in testing the authority's validity, private utilities contended in briefs filed last week with United States District Judge John Gore of Nashville.

Judge Gore had interrupted arguments on T.V.A.'s demurrer on point of jurisdiction to ask briefs from both parties as to whether he could decide jurisdiction without first ruling on constitutionality of T.V.A. (ELECTRICAL WORLD, September 19, page 17).

In the briefs prepared by counsel for the nineteen private utilities, challenging the right of T.V.A. to operate, the utilities reiterated their contention that T.V.A. is unconstitutional and therefore subject to suit anywhere. Even were there doubt of jurisdiction over T.V.A. itself, "there can be no doubt of the jurisdiction of the court over the individual defendants to restrain them from committing unconstitutional and illegal acts," the briefs argued.

The briefs disagreed with the court on necessity of ruling on constitutionality of the T.V.A. Act in advance of deciding the question of jurisdiction. The original bill of complaint, the briefs contended, set up sufficient grounds to question constitutional validity of the act by virtue of which T.V.A. came into existence. The jurisdiction motion, the brief said, "does not present for determination or require a determination of the constitutionality of the T.V.A. Act on the merits but at most merely presents and requires that the court recognize constitutional questions are raised by the allegations of the bill . . . A final determination of the constitutionality of the T.V.A. Act on merits would be improper upon the instant motion; it is sufficient that questions of constitutionality are raised by allegations of the bill."

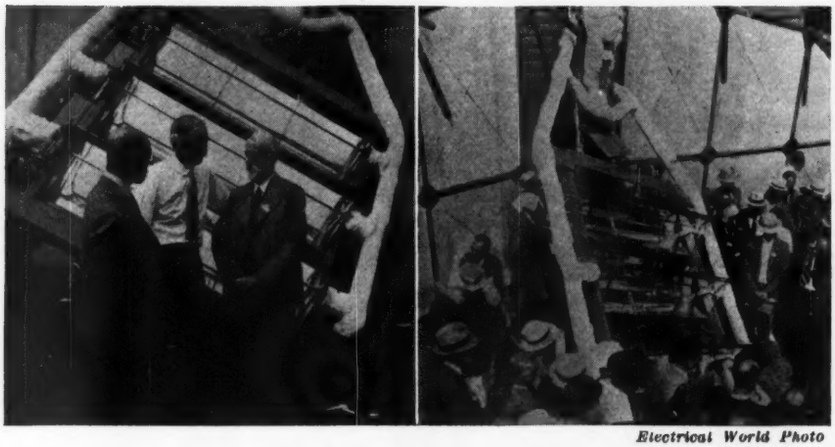
After counsel for T.V.A. has replied to the power companies' brief Judge Gore will set a date for a hearing.

Memphis hearing deferred

Hearing on the application by the Memphis Power & Light Company for a temporary injunction to restrain the City of Memphis from constructing a T.V.A. distribution plant has been advanced to September 28. Originally set for September 18, the hearing was deferred on the plea by the power company for additional time to digest the voluminous demurrer and answer filed by the city on the day set for the hearing in reply to the power company's original and amended bill for injunction.

In its answer, the city, denying that it was engaged in a conspiracy with various agencies of the federal government to compete illegally with the private utility, countercharged that the power company was a link in a national utility conspiracy to defeat the ends of cheap power to the consumer and taxpayer. It also maintains that the court cannot construe, and pass on the legality, of a contract which has not been negotiated as the power bill asks, the bill charging that the city is about to enter into an illegal contract with P.W.A. for the construction of the distribution system. It denies the power company charge that T.V.A. will be allowed to dictate resale rates for electricity and other features connected with the distribution of power.

IT DID NOT CHOOSE TO RUN



Electrical World Photo

At the left, Ing. Ludwig Kallir of Austria, Dr. Charles G. Abbott of Smithsonian Institute and World Power Conference, Chairman William F. Durand discuss the sun motor. At the right, crowds gathered in Washington's hot sun, but the sun motor did not choose to run

Conference Delegates Praise Power Systems

Some 300 official delegates and members of the World Power Conference who are traveling about the country studying American power practice in connection with the post-conference "study tours" paused long enough while in Canada to express themselves as pleased with the activities of private enterprise as typified by the Shawinigan Water & Power Company of Montreal.

The delegates, representing some 50 nations, while in the Province of Quebec visited the St. Maurice River Valley, scene of some of the greatest power developments of the world, and the huge Beauharnois power development of the Shawinigan Company.

The impression received by the foreign delegation visiting the Shawinigan system was interesting. In effect, after what they referred to as the "political atmosphere" of Washington, permeated by what some of the more outspoken visitors referred to as "New Deal propaganda," there was a disposition to regard with some astonishment the achievements in the Canadian field.

Sir Harold Hartley, chairman of the British delegation, said that in the St. Maurice River Valley could be seen the social and economic consequences of power development. The waters of the province had been utilized by the Shawinigan organization to build up industries, with a surrounding prosperous town, in what had been a wilderness 30 years ago.

In summarizing his views on the World Power Conference, Sir Harold said: "There has been a tendency for

people in the different countries to look inward at their own difficulties and problems. At the conference the discussions were directed toward getting people to look outward and see what they are doing in relation to others. No system," he said, "is perfect, whether it is government owned or private, but there may be good points in every one. As most of the discussions at the conference were devoted to the question of distribution, there was naturally a tendency for national temperaments to come out, but from them came a great deal of useful comparisons."

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Wonder House Opened by Brooklyn Edison

Brooklyn Edison Company opened to the public recently its "Edison Wonder House," a completely electrified two-story, ten-room home erected in the company's showroom at 380 Pearl Street, Brooklyn, N. Y. According to A. Augustus Low, executive vice-president of Brooklyn Edison, the "Edison Wonder House" is a practical effort to develop new business by showing in an actual home setting the many modern domestic applications of electricity. The attempt has been made to assemble in it every practicable electrical device now available for promoting health, comfort, and convenience in the home.

The applications on view range from air conditioning to apparatus for opening and closing the bedroom window by pressing a button at the side of the bed, from a spotlight on the keyhole in the front door to an "electric pig" which grinds up and disposes of kitchen waste through the drain in the sink. Lighting is, of course, an important feature.

The Edison company's showroom has been completely reconstructed, and now contains, in addition to the "Wonder House" itself, a small auditorium, a model shop, a group of strikingly modern and brilliantly illuminated store fronts and show windows, and a number of miniature exhibits, or peep-shows, illustrating various facts about light and seeing. More than a hundred firms, manufacturers, distributors, and retailers of building materials, electrical equipment and furnishings, co-operated with the Brooklyn Edison Company in the creation of the Wonder House.

Largest Boulder Dam Customer Postpones Purchases Two Years

Water District, unable to fulfill agreement until 1941, was allocated 36 per cent of firm power — Other customers present difficulties

As President Roosevelt pushed a button at the World Power Conference in Washington, September 11, and said "I give thee life" to Boulder Dam, serious doubts were arising as to who can be found to purchase the power, as one of the largest customers —Metropolitan Water District of Southern California—has found that it cannot take its 36 per cent allocation until 1941, two years later than had been planned.

Power allocations to other customers, in order of importance, are: Nevada and Arizona, each 18 per cent; city of Los Angeles, 13 per cent, and Southern California Edison, 9 per cent; balance to small municipals.

Another 18 per cent allotment, granted to the state of Nevada, will also be seeking a customer as the state will utilize only an insignificant proportion of its allotment. No information seems to be available as to when, where and how Arizona will utilize its 18 per cent of Boulder's ultimate capacity of nearly two million horsepower.

Southern California Edison Company will not begin to use its 9 per cent allotment before two years elapse. It has been supplying the city of Los Angeles, which is turning to Boulder Dam. This leaves the Edison company with unused capacity which must be devoted to some new service before Boulder Dam kilowatts can be used.

With the disposal of two-thirds of the firm power of Boulder Dam presenting the question as to whether uses will be found for the balance of the available power, great dependence is being placed upon the outlet provided by the Los Angeles Municipal Light and Power Bureau.

The bureau originally planned upon using 13 per cent of the firm power and it is hoped that it may be able to absorb more than its share of firm power at 1.63 mills, and also dump power at a half mill per kilowatt-hour.

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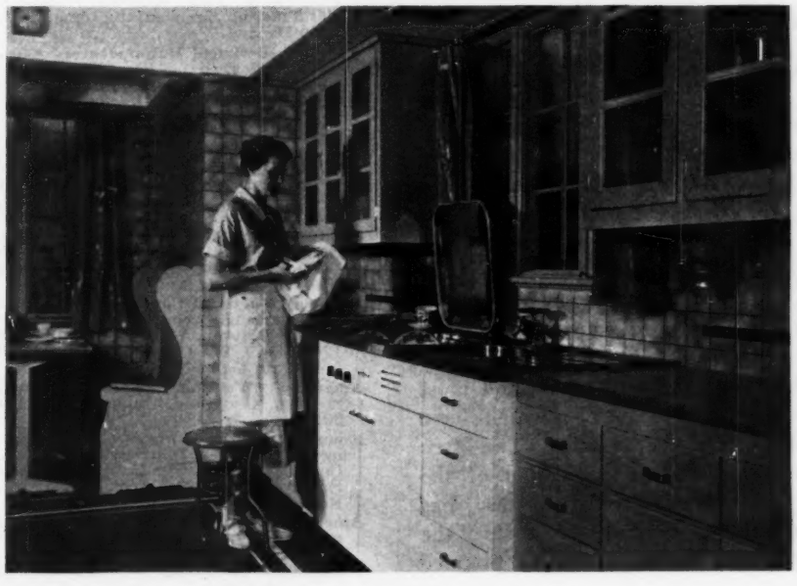
Utilities Lauded at Rotary Meeting

"Man bites dog" almost describes last week's dinner of the New York City Rotary Club held at the Commodore Hotel, at which the guest speaker, Miss Vivien Kellems, talking upon the subject "The Magic Underworld" of public utility companies and upon the

KITCHEN OF BROOKLYN WONDER HOUSE



underground systems, passed bouquet upon bouquet to the industry.

New York Rotarians and visitors, crowded into the hotel dining room, together with listeners on radio station WMCA, were a receptive audience to Miss Kellems' sprightly thirty-minute chat, which to ELECTRICAL WORLD, at least, was a concrete example of the effective assistance which can be rendered to the industry by outsiders who view it objectively.

The speaker has been appearing recently before various groups on the same subject in numerous parts of the country.

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Utility Asks Permit to Transmit Energy

The Federal Power Commission has received from the New York State Electric & Gas Corporation an application for permission to transmit electric energy from the United States to Canada. A single purchaser is named, the Canadian Customs Office at Homingford, Huntington County, Province of Quebec, the New York company being the only available source for supplying such service.

In 1935 the applicant company imported 194 kw.-hr. from the Shawinigan Water & Power Company for the special use of the United States Custom House at the village of North Burke because the custom house was nearer the lines of the Canadian company than those of the New York corporation.

•

Home Service Group Holds Conference

More than 200 home service women of leading utility companies throughout the country attended the recent three-day fifth annual Home Service Conference of the Edison General Electric Appliance Company in the auditorium of the Chicago Lighting Institute, in Chicago.

Conducted by the home economics department of Edison-Hotpoint, the conference, in point of attendance and enthusiasm, was the largest and most successful of the series which have been held by the company. The large attendance was an indication of the advance which electric cookery has made in public interest during the past year. The conference, planned and directed by Miss Frances Weedman, manager of Hotpoint's home economics department, and her assistants, was opened by George A. Hughes, president of the company, who greeted the home economists. Opening with a skit, "The March of Time in Electric Cookery," which dramatized the steady growth of electric cookery from the first Hughes range to the present time, the conference proceeded to a discussion by department heads of the company of electric range design, electric water heating, the electric dishwasher, the commercial electric kitchen, kitchen decoration and other subjects pertinent to home economics work as applied to the utility company.

Widely known magazine editors appeared on the program as well as home service directors of many utility companies.

Meetings

International Association of Electrical Inspectors—Southern Section, Hotel Adolphus, Dallas, Tex., September 28–October 1.

National Electrical Wholesalers Association — Semi-annual convention, Hotel Statler, Buffalo, N. Y., September 28–30. E. Donald Tolles, managing director, 165 Broadway, N. Y.

Empire State Gas & Electric Association —Annual meeting, Saranac Inn, N. Y., October 1–2. C. H. B. Chapin, secretary, Grand Central Terminal, New York, N. Y.

Indiana Electric Association — Annual convention, French Lick, Ind., October 1–2. T. C. Polk, secretary-treasurer, 609 Traction Terminal Building, Indianapolis, Ind.

National Electrical Manufacturers Association—Netherland Plaza Hotel, Cincinnati, Ohio, October 4–10. W. J. Donald, managing director, 155 E. 44th Street, New York.

National Safety Congress and Exposition—Annual meeting, Atlantic City, N. J., October 5–9. Tom A. Burke, director of publicity, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Electrochemical Society—Fall meeting, Niagara Falls, Ontario, October 7–10. Colin G. Fink, secretary, Columbia University, New York, N. Y.

National Electrical Contractors Association — Annual convention, Atlanta-Biltmore Hotel, Atlanta, Ga., October 12–14. L. W. Davis, secretary, 420 Lexington Ave., New York, N. Y.

American Welding Society — Annual meeting, Cleveland, Ohio, October 19–23.

American Institute of Electrical Engineers—Southwest District, Dallas, Tex., October 26–28. H. H. Henline, national secretary, 33 West 39th Street, New York.

American Physical Society — Annual meeting, New York, N. Y., October 29–31. W. L. Severinghaus, secretary, Columbia University, New York, N. Y.

Steam Will Outstrip Hydro, Says A.S.M.E.

Prophecy of an era of fuel-burning power plants highlighted the Niagara Falls meeting of the American Society of Mechanical Engineers, held September 16–19, attended by a number of foreign delegates to the World Power Conference as well as by members of the society.

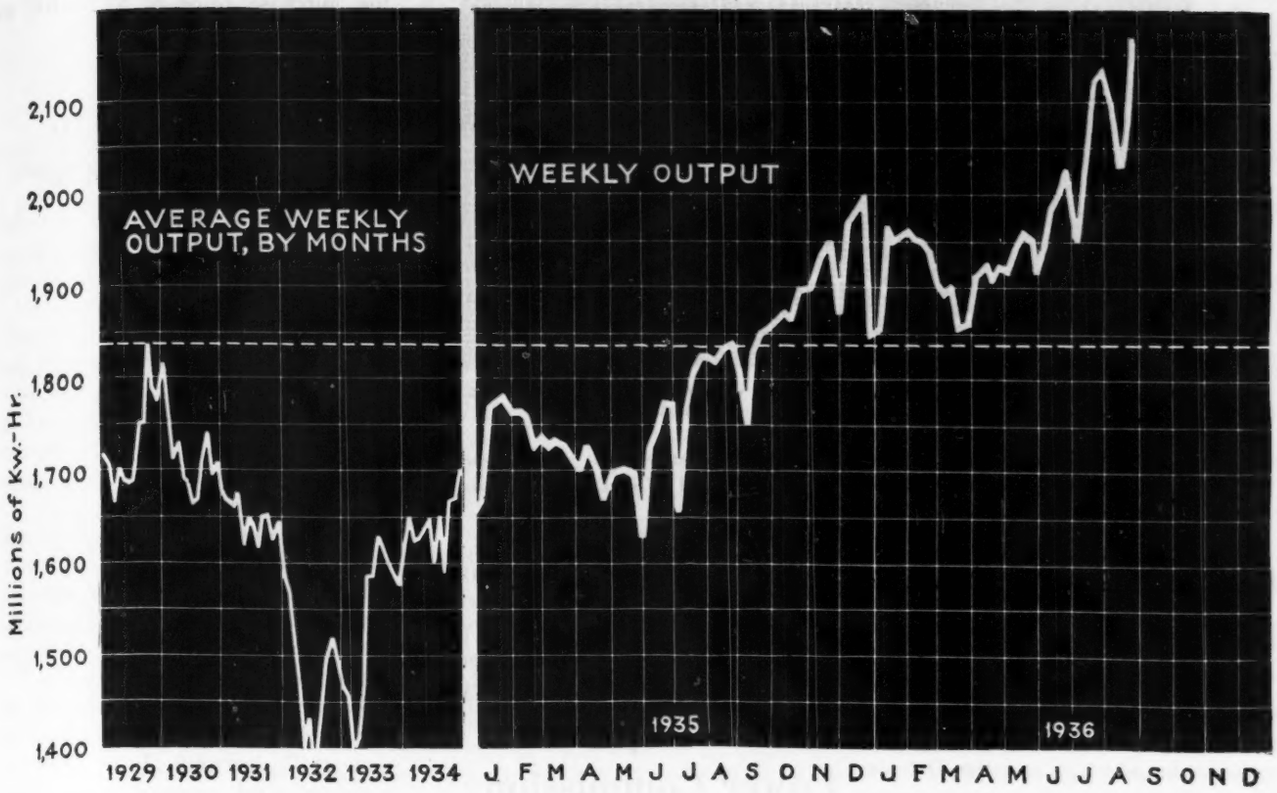
Several papers were presented in support of this theory. Included in those presented at the Thursday session were: "Superposition," by E. H. Krieg of the American Gas & Electric Company of New York City; "German Boiler and Turbine Practice," by Dr. Otto Schoene, professor at Technical University, Berlin, and official German delegate to the World Power Conference, and "Trend of Design for 500- to 800-lb. Pressure Steam Electric Plants," by J. A. Powell of the E. M. Gilbert Engineering Corporation, Reading, Pa.

Discussing German practice, Professor Schoene told of the tendency toward high-pressure steam plants, with the pressure at 2,100 lb. per square inch. In Germany there are now 50 plants using pressure of 1,500 lb. per square inch or more. These plants are compelled to use very low-grade fuel—testing 3,000 B.t.u., as against fuel testing 6,000 B.t.u. in this type of American plants — which makes 35 to 45 per cent ashes as against 12 per cent in American plants. In spite of this handicap, the German high-pressure plants are able to obtain economy of operation and an increase in by-product power.

In a talk with a representative of the press, J. C. Hobbs, Painesville, Ohio, a member of the power division of the executive committee of the A.S.M.E., said: "The hydro power development this year has exceeded the steam in capacity, but from now on the trend will be toward fuel-burning power plants."

Other papers were presented at the meetings on Friday, including a discussion by H. M. Cushing, chief engineer of the Buffalo General Electric Company, on the operating conditions at Huntley station; design and operating problems when using gas- and oil-fired boilers for standby steam electric stations, by V. F. Estcourt; German furnace design and combustion, Dr. Otto Schoene; Canadian hydro-electric practice, Dr. T. H. Hogg.

Output Greater Than Ever Before



As the operations of central station plants rise toward the winter peak, each week's reports show that the lead over corresponding periods of all earlier years is being fully maintained. Also, except as affected by holidays, each week's production is establishing a new all-time record with almost monotonous regularity.

During the week ended September 19 the energy generated amounted to 2,170,807,000 kw.-hr., according to the Edison Electric Institute. This was 17.2 per cent higher than in the like week of 1935 and 21 per cent above 1929. It overshot the previous maximum, attained only three weeks earlier, by 35,000,000 kw.-hr. In the South the gain over 1935 continues around 23 per cent and in the Central industrial area it is close to 20%.

Weekly Output, Millions of Kw.-Hr.

1936	1935	1934
Sept. 19..2,171	Sept. 21..1,852	Sept. 22..1,631
Sept. 12..2,029	Sept. 14..1,828	Sept. 15..1,634
Sept. 5..2,099	Sept. 7..1,752	Sept. 8..1,565
Aug. 29..2,135	Aug. 31..1,810	Sept. 1..1,627
Aug. 22..2,125	Aug. 24..1,839	Aug. 25..1,648
Aug. 15..2,094	Aug. 17..1,833	Aug. 18..1,674

Per Cent Change from Previous Year

	Week Sept. 19	2 Weeks Sept. 12	Week Aug. 29
New England	+16.1	+14.0	+13.7
Middle Atlantic	+16.4	+12.8	+16.7
Central Industrial	+19.5	+18.5	+21.5
West Central	+13.0	+13.7	+18.5
Southern States	+23.3	+23.4	+23.3
Rocky Mountain	+16.7	+14.0	+13.8
Pacific Coast	+ 8.9	+ 9.7	+11.4
United States	+17.2	+15.3	+18.0

Steam Loads Jump as Waters Run Low

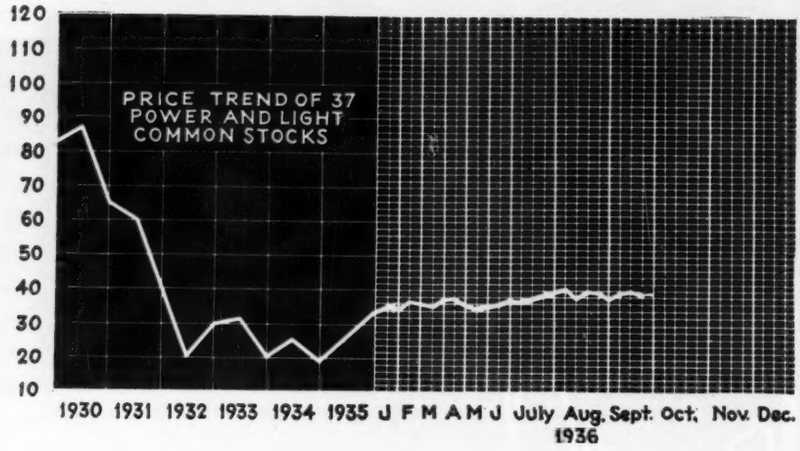
Public utility plants increased their output in July by 15 per cent over the like month of 1935 to 9,602,000,000 kw.-hr., according to statistics announced by the Federal Power Commission. The unusual gain recorded in June, amounting to 16 per cent, was thus almost duplicated. Persistent growth is indicated by the statement that the output for the first seven months of the year was 13 per cent greater in 1936 than in 1935. For the twelve months ended July 31, 1936, the output totaled 106,914,000,000 kw.-hr., against 99,397,000,000 during the calendar year 1935.

Production in the summer usually falls off somewhat compared with the preceding winter. The current year is an exception, in that the figure for July exceeded that of last December by 5 per cent and set new records both for monthly and for average daily energy generated.

Region	Output (Millions of Kw.-Hr.) Hydro	Fuel	Increase (Per Cent) Hydro	Fuel	Total
United States..	3,130	6,472	−13	+35	+15
New England...	181	425	−18	+33	+12
Mid. Atlantic...	468	1,911	−35	+34	+11
E. No. Central..	126	2,049	−44	+26	+17
W. No. Central.	92	526	−52	+39	+8
So. Atlantic....	379	726	−16	+92	+24
E. So. Central..	308	127	− 2	+149	+19
W. So. Central..	11	495	−17	+13	+12
Mountain.....	328	72	+19	+26	+20
Pacific.....	1,237	151	+11	+51	+14

A decrease in the available energy from water power threw a greatly increased burden on the fuel-burning plants. Production from the former source was 13 per cent less than in the like month a year ago, whereas that from fuels was a full third greater—an unusual rise even during a period of industrial acceleration. More detailed comparisons for the various geographic divisions are shown in the table, which gives the output in millions of kilowatt-hours and the per cent change compared with July, 1935. The data refer to *all* public utilities and not exclusively to central stations for light and power.

Utility Stocks Advance Slightly



A mixture of gains and losses in the prices of electric light and power stocks resulted in a slight advance in the "Electrical World" index: this week, 38.8; last week, 38.7

Large Issue Floated by Detroit Edison

Public offering was made this week of a new issue of $20,000,000 of general and refunding mortgage 3½ per cent bonds, series G, of the Detroit Edison Company. The bonds were priced at 105 and accrued interest and fall due on September 1, 1966.

Proceeds from the sale, $20,600,000 without allowing for estimated expenses of $120,870 which will be paid from other funds, together with $1,066,666, will be used to redeem on October 1, 1936, at 107½ and accrued interest, all of the company's outstanding $20,000,000 general and refunding mortgage 5 per cent bonds, series C, due in 1962.

Connecticut Light & Power Company has filed a registration statement with the S.E.C. covering $7,000,000 of first and refunding mortgage 3½ per cent bonds, series F, due September 1, 1966, and $7,500,000 of twenty-year 3½ per cent debentures, due September 1, 1956. Proceeds will be used in the payment of existing bank loans, redemption of outstanding securities on several of its subsidiary companies and for additions and improvements to its property during the present year.

Pacific Gas & Electric Company filed this week with the S.E.C. a registration statement covering a proposed offering of $35,000,000 of 3½ per cent, series I, first and refunding mortgage bonds. Public offering will not be made earlier than October 13. Proceeds from this financing will be used to provide funds for the redemption of $35,780,000 of 5 per cent general and refunding mortgage bonds, which are redeemable on January 1, 1937, at par and accrued interest.

•

Power Commission Forbids Merger

A blow to the present jurisdiction of state commissions and a new conception of the broad powers under section 203 of the Federal "water power" act were seen in this week's decision of the Federal Power Commission to prohibit the proposed merger of two operating companies, Northern Pennsylvania Power with Metropolitan Edison Company, and corollary transfer of $2,532,040 in cash and bonds.

An important point, which has not been pointed out generally, is that the Power Commission took no exception to the merger as such nor to the transfer of cash and bonds, but did object to the transfer to a holding company. Making this distinction may represent a new high-water mark in holding company regulation and management by governmental bodies.

"Since the commission, after careful examination of the evidence of record reaches the conclusion that the proposed transaction in its present form cannot be found to be consistent with the public interest," the decision read, "it is unnecessary to discuss in this opinion other elements entering into this consideration of public interest."

The Pennsylvania Public Service Commission disapproved the merger on the same day because it considered the purchase price of $2,532,040 as too high by $515,451.

•

Central Hudson to Convert Preferred

"The Central Hudson during recent years," said Ernest R. Acker, president Central Hudson Gas & Electric Company, discussing the company's plans to convert seven million dollars of preferred stock from 6 per cent to a 4½ per cent basis, "has been able to make continual reductions in the rates charged for its services only by constant economy and wider application of those services.

"Faced now with higher taxes and rising prices, the company must consider every possibility in connection with its financing and its operations generally, which will assist in maintaining a sound financial position."

Last year the company refunded its 5 per cent mortgage bonds with an issue at 3½ per cent. In the proposed preferred stock conversion plan holders of the 6 per cent preferred will be asked to exchange for new 4½ per cent stock on the basis of one share of new stock and $2.50 in cash for each share of 6 per cent stock.

•

New England Gas Sells Holdings in Canadian Unit

The Royal Securities Corporation, with headquarters in Montreal and branches in key centers in the Dominion of Canada, as stock brokers and financial promoters, has purchased all the security holdings of the New England Gas & Electric Association in the Maritime Electric Company, which distributes electric energy to sections of Prince Edward Island and of the Province of New Brunswick.

•

E.H.F.A. to Aid Sales in Los Angeles Area

Electric Home and Farm Authority announced it has entered into a contract with the Department of Water and Power at Los Angeles. The contract covers financing in conjunction with E.H.F.A. of appliances purchased by domestic customers of the municipal system.

Manufacturing AND MARKETS

Record Crowd Visits N. Y. Electrical Show

Approximately two hundred thousand people visited the 1936 National Electrical and Radio Exposition during its eleven-day run at Grand Central Palace in New York, gave some manufacturers four times the business of last year and indicated decided preferences for "quality" appliances.

Most popular was the exhibit of a one-room apartment and 6,000 people each afternoon saw the way in which electric service and appliances converted the small apartment into a virtual home.

"They were out for the newest and best," one sales manager volunteered, "with price considerations running second to quality."

Higher priced radios, better class of electric ranges and refrigerators and other major appliance sales were described as "very gratifying."

Lectures were given daily by domestic science representatives and were well attended by home-managers visiting the show.

No sales figures are announced as yet by exposition exhibitors, but many comments were made as to the record crowds, the renewed interest in quality appliances and the willingness to purchase on the part of visitors.

•

Seventeen Miles of Sodium Lighting Turned On

Seventeen miles of the traffic-laden New York State Highway connecting Binghamton and Schenectady were illuminated this week for the first time by 391 sodium-vapor highway units developed by General Electric Company.

Several thousand persons, attending the ceremonies in company with city and state officials, heard predictions that the new lighting would reduce by one-half the annual average of persons killed or injured on this 17-mile stretch. The lights were turned on by a daughter of State Highway Commissioner Arthur W. Brandt and cars proceeded in both directions thereafter with headlights turned off.

•

Kelvinator Men Sail on Tour

Headed by George W. Mason, president and chairman of the board, 600 Kelvinator men sailed on the *Franconia* on September 21 for Havana on a good-will tour.

Anniston Has Newest Viaduct Lighting Job

An outstanding lighting job in the South was that recently installed on the Bankhead Highway viaduct leading into Anniston, Ala. The viaduct is 466 ft. long and 30 ft. wide. Lighting is provided by means of fourteen Crouse-Hinds type VC D-12 recessed lighting units. Seven units are mounted on each side of the roadway and recessed in the side walls. Two circuits with ½-in. conduit are used.

The lighting system was engineered by T. J. Day of the Alabama Power Company and installed by the Weir Electric Shop of Anniston. The power company estimated the lighting system would cost $336 annually to operate. Since that time a rate reduction has been made, reducing this figure about $100.

Note the sidewalk on the left side, which is 5 ft. wide and elevated 8 in. above the road level.

New lighting at Anniston, Ala., employs 200-watt medium pre-focus lamps in Crouse-Hinds Type VCD-12 lighting unit, shown in detail at left. Night view of the bridge is shown below

Electrical Orders Far Above 1935

Sharp gains are shown by orders booked for electrical goods. During the first half of 1936 they exceeded in value those of the first half of 1935 by 34 per cent and they were 2½ times as large as in the same part of 1933, a U. S. census report indicates. The increase over 1935 during the first quarter was 26 per cent and during the second quarter 41 per cent.

The report is based on returns from 78 manufacturers, whose bookings in 1933 were equal to 59 per cent of the total production for that year. Reference is made to 1933 because it is the latest year for which data are available for the entire electrical manufacturing industry. In that year the factory value of electrical products was very close to $550,000,000.

As published in the ELECTRICAL WORLD of January 4, 1936, the estimated value in 1934 was $700,000,000 and in 1935 $850,000,000. These estimates are more than supported by the corresponding increases in orders booked and include an allowance for the lag of production behind orders during a period of rising industrial activity.

Assuming that the rate of increase over 1935 of orders booked during the first half year is maintained, the factory value in 1936 will be around $1,140,000,000, or nearly $300,000,000 more than in 1935 and more than double the value of products in 1933.

•

Mallory Company to Build $100,000 Addition to Plant

The P. R. Mallory Company, Indianapolis, Ind., manufacturer of electric switches and controls and other electrical supplies, has awarded a contract to O. W. Wise, 2537 Burton Avenue, for a one-story addition to its plant, 130 x 320 ft., estimated to cost close to $100,000, with equipment. Kopf & Deery are the architects.

New York Metal Prices

	Sept. 16, 1936 Cents per Pound	Sept. 23, 1936 Cents per Pound
Copper electrolytic	9.75*	9.75*
Lead, Am. S. & R. price	4.60	4.60
Antimony	11.5	11.875
Nickel ingot	35.00	35.00
Zinc spot	4.85	4.85
Tin Straits	44.875	45.00
Aluminum, 99 per cent.	19—21	19—21

* Delivered Connecticut Valley.

Field Reports on Business

Reports to ELECTRICAL WORLD *from the field indicate that the retail and wholesale trades are sustaining their volumes well above last year. The heavy industries continue at an excellent pace, with steel the outstanding feature. Secretary Roper of the Commerce Department recently said: "We have entered, not a temporary but a long-term upward swing." Reports from the firing line indicate that what Secretary Roper said is substantially in line with what a growing body of business men are thinking.*

NEW ENGLAND

Inquiries are steady and sales of electrical equipment are being maintained in this district. From well-founded sources the opinion is current that interest in electrical supplies and apparatus will continue on into the last quarter of the year with little abatement.

Motor sales are encouraging and well diversified. Recently a prominent manufacturer sold 26 motors to a New England shoe factory, aggregating 100 hp., to modernize its machinery drives and improve the power factor. A nationally known machine-tool manufacturer reports an increasing demand for motor-driven machinery and noted the delivery to date this year of 56 special electric-controlled shapers to a Connecticut company and an order for ten of this type to a western Massachusetts location. Sales of electrical equipment in Rhode Island are in good volume and activity in a wide diversity of industries in that district is at a good level.

Sales of insulators for rural line extensions are increasing. A distributor of contractors' equipment records an interest in motor driven wood-working machinery. The broad range of interest is further noted in an order for a 3-ton industrial electrical truck manufactured by the Baker Raulang Company. Merchandising is active throughout this district. In Vermont a group of central stations sold 32 electric ranges during the past week. Refrigerator sales are encouraging; interest in box capacity above 10 cu.ft. is increasing.

PACIFIC COAST

General business conditions, barring potential labor threats, continue excellent and the mounting tide of construction is augmented by small industrials and larger apartment houses. Such outstanding jobs as the Los Angeles Government Building and Union Depot for $6,000,000 each, permanent exposition structures and bridge terminals for San Francisco totaling as much more, two $1,000,000 warehouses for army air base at Sacramento and the $2,000,000 beet sugar plant for Woodland are ready for construction and will probably reach their peaks before the end of the year, thus insuring a sizable nucleus for wholesalers to add to their steady and well-distributed demand.

Mine purchases are tapering off with the completion of new installations or deepening equipment, but maintenance material will apparently continue through the winter. A $7,000,000 prune and apricot crop association distribution, principally in San Jose area, and a 10,500,000-case peach crop are indications of an even better electrical building and appliance business from the crop district towns, which are running proportionately better than the cities at present.

New school construction includes $700,000 for scattered southern California cities and $750,000 for Sacramento. Westinghouse is opening a jobbing branch in Sacramento. Power company purchasing continues good this week, largely covering glass insulators and hardware for central stocks rather than particular jobs.

CHICAGO

Although losing momentum because of various seasonal adjustments, business activity in this district continued forward at an encouraging pace. Retail trade remained steady and the turnover was greater than a year ago. Expanding activity in building and complementary lines asserted a stabilizing effect, offsetting declines in other fields. Building construction in Illinois last month registered a gain of 42 per cent over a year ago. The activity has been predominantly residential, the construction of industrial and commercial structures being mostly small plants or additions to and modernization of existing buildings.

Contract was awarded to a local contractor for construction of an R.E.A. project involving 250 miles of lines to cost about $250,000. One manufacturer of wire and cable reports heavy sales to steel mills, utilities and railroad shops. A prominent elevator manufacturer reports a sales increase of 43 per cent. There is an increased demand for electric welding equipment. Substantial orders for electrical equipment have been received from various stock yards plants.

Lighting equipment manufacturers report increased demand for commercial and industrial fixtures. Portable lamp sales are exceptionally good. Reports from wholesalers indicate more favorable dealer activity as stocks show a more rapid turnover and collections constantly improve.

NEW YORK

The last 10 per cent of recovery, including September and October, cannot be said to have strained productive capacity; the next 10 per cent will to an acute degree. There are exceptions, but generally and broadly speaking, an additional 10 per cent of recovery would bring the discovery of inadequate steel plants, inadequate freight cars, inadequate supply of skilled labor.

Retail trade promises to continue excellent through the December seasonal peak. Good fourth quarter automobile production is practically assured and 5,000,000 cars for 1937 looks like a conservative and reasonable estimate. Residential building now enters its dull seasonal period of cold weather, but volume in 1937 should be well above that of 1936.

Steel production, if it reaches 80 per cent of capacity soon, as executives in the industry expect, would be vulnerable to recession toward the end of the year.

AUTOMATIC NEWS SWITCHING

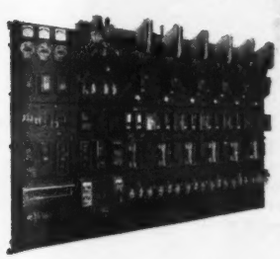
SWITCHGEAR HEADQUARTERS ★★★★★

SIX BIG SUBSTATIONS SUPERVISED AT ONE PANEL

UNSUNG HERO OF SYSTEM PROTECTION

Big automatic switching equipments are not the only ones that improve service and cut the cost of putting power to work.

Hundreds of G-E d-c automatic reclosing feeders—heroes who seldom make the headlines—are on duty every



day keeping the wheels of industry turning. These equipments are steady, reliable performers. They cut off power speedily when an emergency arises, then automatically restore service as soon as the emergency is over.

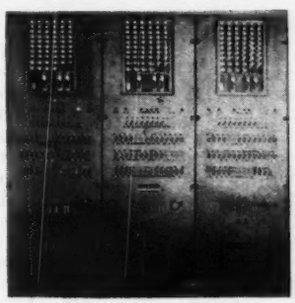
CONTROLLING BIG VARIABLE-RATIO CHANGER SETS

Pioneering in automatic switchgear is a habit with General Electric. For example, the first automatic control for large frequency-changer sets was a G-E installation in St. Louis.

This automatic equipment controls two 20,000-kw frequency-changer sets having the Scherbius system of load and voltage control. Automatic features include starting, voltage regulation, synchronizing, load limiting, and protection.

Automatic synchronizing of both the 25-cycle and 60-cycle units is provided. The load-limiting feature is especially valuable because—by automatically preventing overloading of the frequency-changer sets—it permits the sets to handle a higher average load than would be practical with manual adjustment.

G-E EQUIPMENT MEETS UNIQUE REQUIREMENTS OF RAILWAY SYSTEM



Part of supervisory control in power dispatcher's office

An important railway electrification involving six substations offered General Electric the opportunity to build a large automatic supervisory system operating on the code selector scheme in which each of the substations controlled had a large number of circuit breakers.

As many as 58 breakers, or equivalent units, and 10 telemetering readings are supervised in a single substation.

Each of the substations is connected to the dispatcher's office by two wires in a telephone cable, and the selective telemetering readings are transmitted over a separate pair of line wires common to all stations.

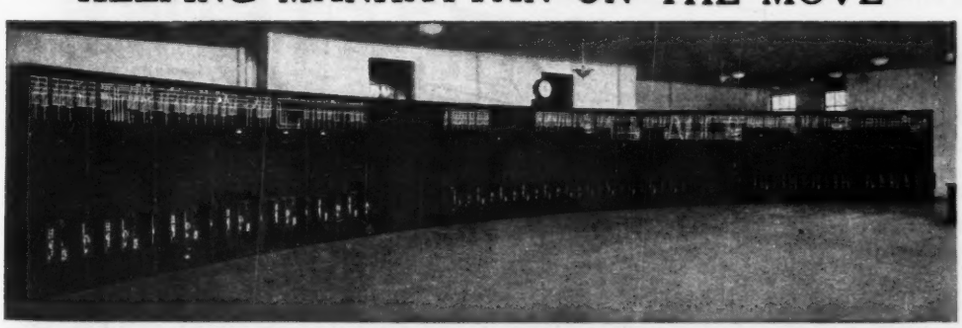
One additional pair of wires is provided, with transfer equipment which permits it to be used to control any one of the stations.

The remotest substation is 47 miles from the dispatcher's office.

G-E Engineers Will Help You Plan Your Automatic Equipment

When you are planning automatic-switching installations, you will find it profitable to take advantage of our experience in designing and building all types of automatic-switching apparatus. Just call the nearest G-E office. General Electric Company, Schenectady, N. Y.

KEEPING MANHATTAN ON THE MOVE



Headquarters of the world's largest supervisory system—the G-E dispatcher's supervisory control and indicating board in the central substation of the City of New York Independent Subway System. From this board are controlled all the 625-volt d-c machines and feeders of the system on Manhattan Island.

OUTAGES AVOIDED WITH AUTOMATIC STANDBY UNITS

Two 50-kw gasoline-engine-driven generators with G-E automatic starting provide emergency service for a well-known New York county home for old people.

In the event that power fails, one of these engine-driven generators is started automatically, and supplies power to the load. The second unit starts automatically in case of failure of the first unit or manually by an attendant when desired.

Automatic control for standby units of this type can be provided to perform in any desired manner.

GENERAL ELECTRIC

880-9

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Protection of Wires in Trees

The construction department of the Boston Edison Company has recently established the following standard practice in protecting wires passing through trees from grounds, crosses and abrasions.

Four methods are used: Tree trimming, cabling, cutting over and the installation of tree wire, wire molding or guards, and tree insulators. When permanent tree trimming or the removal of conflicting limbs is possible this is the preferred method. Cabling is used in the case of a tree judged to be weak when the trunk divides or branches in such a way that a branch would fall toward the wires if the tree should split at the fork. This liability may have to be determined by a tree expert in some cases. Where it is practicable wires are cut over to other pins or run on outrigged arms to give proper permanent clearance, giving due consideration to the future use of idle pins.

Three types of tree exposure are recognized and are to be protected in accordance with the figures in the accompanying table when using tree wire, molding, guards and tree insulators:

Exposure A, in which some or all the wires of a span are subject to contact of swaying limbs. On primary wires, except the neutral wire of primary circuits with grounded neutral, and street lighting wires, full spans of tree wire are installed to protect such exposures. Opposite all limbs 1 in. in diameter or larger, all wires, both tree and line, are protected from abrasion by short lengths of wood molding.

Exposure B, in which part of a span is subject to contact with swaying limbs 1 in. in diameter or larger. On primary wires except the neutral wire of primary circuits with grounded neutral and street lighting wires, short lengths of tree wire extending 20 in. on either side of probable sway of foliage are spliced in and protected from abrasion by wood molding. Several extra splices can profitably be made in order to avoid the unnecessary use of tree wire. If it is impossible to splice tree wire in place, the spans, with the tree wire sections measured out, can be economically made up on the ground and strung in as new wire. A truck and team can economically spend one-half hour to avoid the unnecessary use of 20 ft. of No. 1/0 tree wire or 40 ft. of No. 4 or No. 6 tree wire.

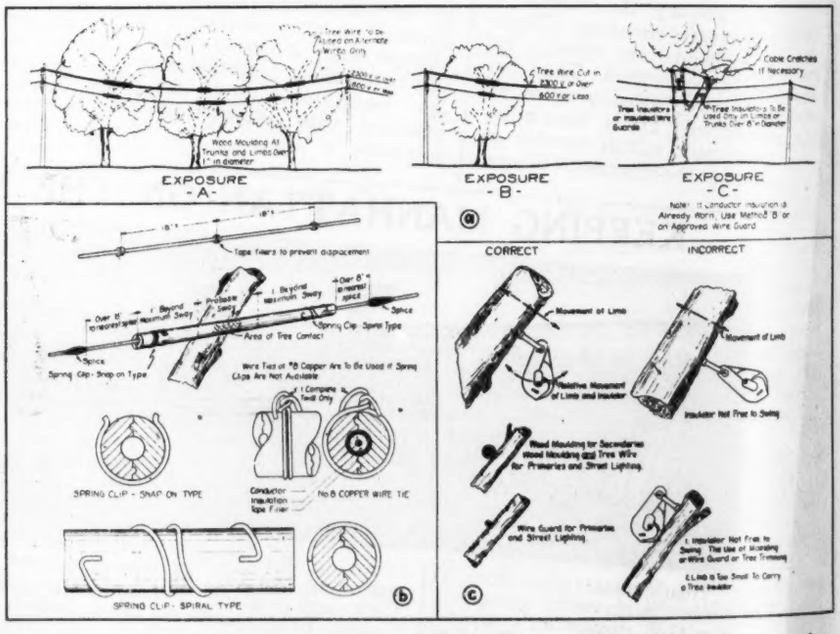
Exposure C, in which the wires are exposed to contact with sound limbs and trunks over 7 in. in diameter where the wind sway is of small amplitude. On primary and street lighting wires, if the wire is not already worn, use (A) tree insulators or (B) special bakelite cloth wire-guards. If the wire is already worn, splice in short sections of tree wire and cover with wood molding. On secondary wires, splice in new line wire, if necessary. Cover with wood molding.

Installation of Tree Wire—Tree wire is of medium hard drawn copper and all splices should be made with tubular connectors or automatic splices, but never with Western Union splices. Automatic splices are preferred on account of ease of installation in awkward position in trees.

Application of Wood Molding—Three sizes of wax-impregnated wood molding are kept in stock; ½-in., ⅝-in. and 15/16-in. molding is to be used according to the following table:

Wire Size	Outside Dia. In.	Size Molding In.
No. 6 Line	5/16	½
No. 6 Tree	9/16	⅝
No. 6 Triplex	⅞	15/16
No. 4 Line	⅜	½
No. 4 Tree	9/16	⅝
No. 2 Line	15/32	½
No. 1/0 Line	⅝	⅝
No. 1/0 Tree	15/16	15/16
No. 4/0 Line	13/16	15/16

Two pieces of molding are cut about 3 ft. long, or a length to extend 12 in. beyond the probable sweep of limbs on each end. To prevent lateral displacement of the molding wraps of friction tape are spaced about


EXPOSURE -A-
EXPOSURE -B-
EXPOSURE -C-
Tape Wires to prevent displacement
Spring Clip - Snap on Type
Spring Clip - Spiral Type
SPRING CLIP - SNAP ON TYPE
SPRING CLIP - SPIRAL TYPE
No 8 COPPER WIRE TIE
CORRECT
INCORRECT
Movement of Limb
Relative Movement of Limb and Insulator
Wood Moulding for Secondaries
Wood Moulding and Tree Wire for Primaries and Street Lighting
Wire Guard for Primaries and Street Lighting

(a) Types of wire exposure in trees which determine method of protection. (b) Application of tree molding. (c) Correct and incorrect methods of mounting tree insulators

FLASH

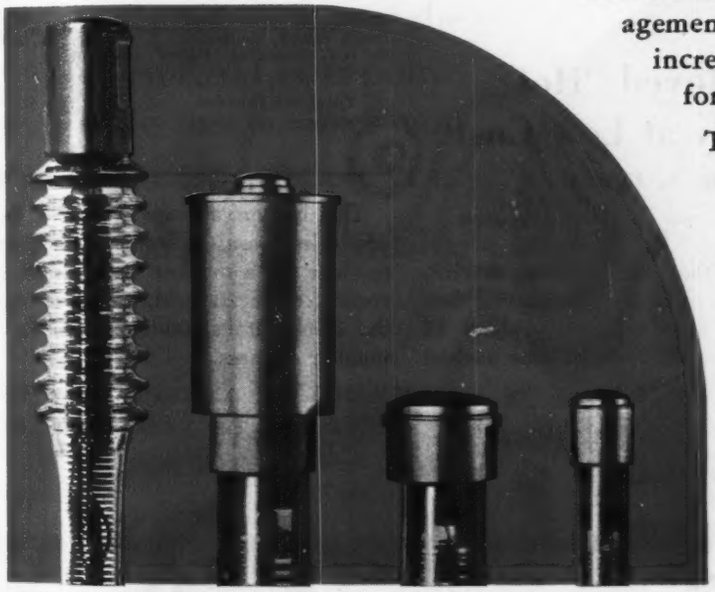
BIG INCREASE IN SUBSTATION USE OF S & C LIQUID FUSES

New Load Conditions Now Demand the Best Insurance Against Unnecessary Outages and Equipment Damage

● Compromises with protection which lean years made necessary seem to be over . . . With the increased and steady load—power companies see greater need for the best possible protection. An outage is a more serious occurrence than ever before.

This thinking on the part of power company management and engineers is evidenced by the steady increase in installation of S & C Liquid Fuses for improved substation protection.

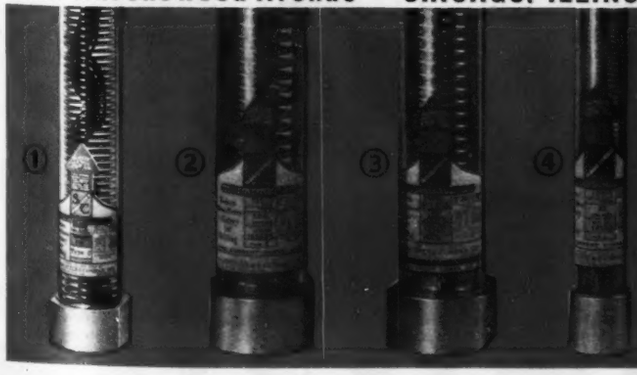
The accuracy—dependability—and insured protection provided by S & C Fuses have been proven for many years . . . Trade in blown or obsolete types now for the latest—liberal allowances made.



EXPERIENCE WILL CHOOSE THE S&C REG. U.S. PAT OFF **FUSE**

SCHWEITZER & CONRAD, INC.

4435 Ravenswood Avenue • CHICAGO, ILLINOIS • Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Canada



① The new 69 to 138 kv corrugated fuse has 30% more insulation for high recovery voltage conditions, and has 20% higher interrupting capacity.

② Heavy duty, Type C with extra condensing chamber is well suited for all confined spaces and where short circuit conditions may be severe.

③ Type D has high interrupting capacity—recommended for outdoor and indoor substations, and industrial installation.

Low current, DLC fuses are for potential transformer applications—connected in primary and operate on secondary faults as well as primary.

④ Light-duty, Type B fuses (1 to 25 amps—to 69,000 volts).

18 in. apart between wire and molding, preceding fitting of sections, clamping and tying or spring clipping when required.

Application of Tree Insulators—This is limited to exposure C. The insulator is screwed into a limb or trunk at least 7 in. in diameter. If the limb is smaller than 7 in., trimming or the use of a wire guard is indicated. The insulator is mounted to take up by rotation the relative movement of wire and limb as far as possible.

Approved wire guards may be used according to manufacturers' instructions.

•

Three Transformers on a Single Pole

By R. A. HAMMACK

Overhead Standards Engineer Public Service Company of Colorado, Denver

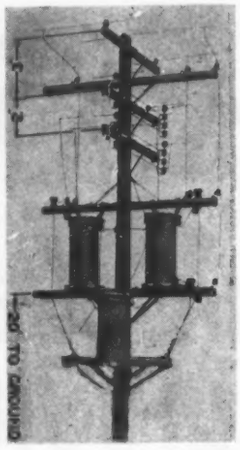
Safety of workmen was kept uppermost in mind in designing the single-pole, three-transformer installation shown in the accompanying installation. The result is that the usual congested job has been simplified to the point where it can be worked and serviced with the safety usually provided only in single-phase installations.

This has been accomplished by mounting the transformers in such a way that the climbing space on the back of the pole is kept clear and fuse cut-outs and lightning arresters are readily accessible. Also, more simple wiring and better wiring clearances are obtained than if the three transformers are hung on the same arm or in other ways.

Another advantage of this installation is that larger transformers can be used, for the reasons that the transformers are kept in closer to the pole and the two upper transformers are set on the double arm, platform fashion, instead of hanging from an arm above. The hangers of the two upper transformers have been reversed and hooked over the upper crossarm for stability and to keep the transformers from slipping off the double arm upon which they are set. The upper crossarm is not intended to carry the weight and the hanger irons are hooked over it for the additional safety factor only. This is important in the event the pole is bumped by a truck or automobile.

Installations of this type are limited by the Public Service Company of Colorado to use on 2,300-volt or 4,000-volt systems only. Where the new pressed steel tanks are used we have found it satisfactory for transformers up to and including 50 kva. Where old style transformers with cast-iron tanks are used sizes are limited to 30 kva.

Two sets of secondary buses and



Simplified one-pole bank

The two top transformers are set out 1 ft. from the face of the pole on each side. Minimum pole height is 40 ft.

bus racks are shown, to illustrate how service loops may be taken from the pole without fouling primary risers or climbing and working space. One bus is for pulling loops from a three-wire secondary and the other from the three-phase secondary in the event both are present on the pole. In many cases only one set of bus racks is required, and in some cases none are used, depending upon whether or not loops can be run without fouling other wires or climbing space.

•

Line Moved "Hot" Quickly at Low Cost

By V. E. STAFF

Construction Superintendent Louisiana Public Service Corporation, Lockport

Raising the pole with a derrick, holding the butt in a V-notch and then carrying the pole laterally about 12 ft. to its new location was the method used to move 7 miles of energized 13,800-volt line between Lockport and Raceland.

The line is three-phase, three-wire on 35-ft. poles with 8-ft. crossarms. On the second gain along the whole length of the line are secondaries for local distribution. The poles are set 200 ft. apart. Highway widening required relocation of the line on the new property line.

After the four men who did all the job except dig the new holes had worked in a bit, they became very expert at handling the poles. The job then marched along at a rapid pace and with accompanying low costs. The average cost, exclusive of overhead, for the entire job was $1.47 per pole moved. At one place there were 25 poles located in a reasonably straight line.

The time taken by the four-man crew to move these poles was six hours. The average distance was 12 ft. The cost was:

Digging 25 holes (labor)	$7.20
Truck rental, six hours	12.00
Moving, resetting (labor and supervision)	10.80
Total for 25 poles	$30.00
Average per pole	1.20

The higher average cost for the whole line resulted from the necessity to clear out a number of trees and to construct special bridging for getting the truck into suitable position in a number of cases.

Up and over and down again in a new place

THE natural resistance of the seasoned wood of Western Red Cedar to the passage of electrical current is very high.

This inherent characteristic is of outstanding importance to utilities during the lightning season, affording protection against costly damage and against service interruptions.

The natural low conductivity of Western Red Cedar poles reduces operating costs in many ways, such as—

Safeguarding linemen doing high tension "hot line" work.
Reducing lightning outages.
Providing a valuable margin of safety against damaged equipment, carelessness and accidents.

This safety feature is one of the many Western Red Cedar points of superiority that enables you to attain low cost per pole year.

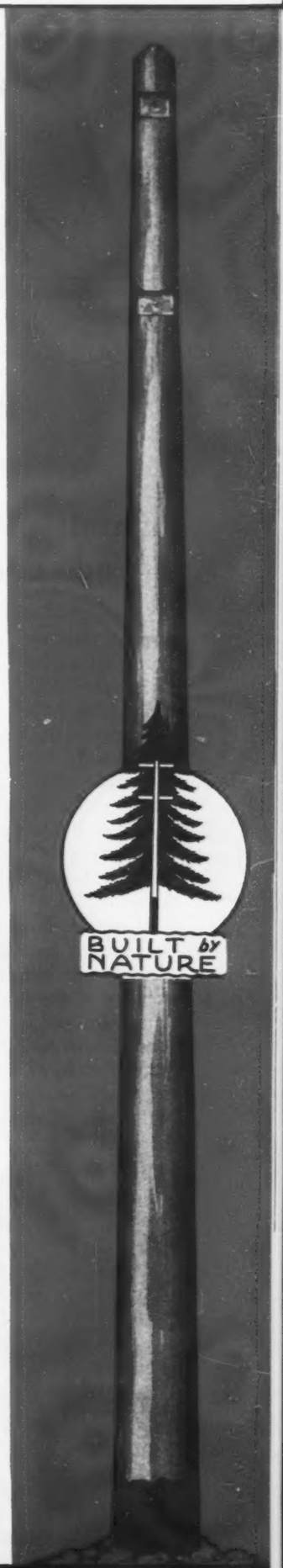
Standardize on these dependable poles.

WESTERN RED & NORTHERN WHITE CEDAR ASSOCIATION
Metropolitan Bank Building
Minneapolis Minnesota

NOTE THESE EXCLUSIVE QUALITY FEATURES OF WESTERN RED CEDAR—

- Western Red Cedar Poles are straight, strong, rigid, yet light in weight.
- Their large heartwood, preserved by nature, is highly resistant to decay and insect damage.
- Western Red Cedar combines, in one wood, more basic power line pole properties than found in any other pole timber.
- The natural preservative of Cedar is permanent . . cannot be varied, and is constant and effective from the top to the bottom of the pole.
- Additional gains can be added and holes drilled anytime after erection for joint use or for installation of additional equipment without endangering the life of the pole.

The vast forests of Western Red Cedar assure a continuous, ample supply to meet the full requirements of the utilities.



CEDAR POLES

Construction and Maintenance

Power AT WORK IN INDUSTRY

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Laundry Ventilation Speeds Production

Cleanliness and employee comfort are the ends and aims of what might be called a "super-ventilation" installation at the Knickerbocker Laundry, Long Island City. Exclusion of dirt and the maintenance of reasonable temperature both summer and winter in this modern laundry, which employs about 400 people, is attained with two washer and blower installations working in conjunction with eight exhaust units totaling in all about 60 hp.

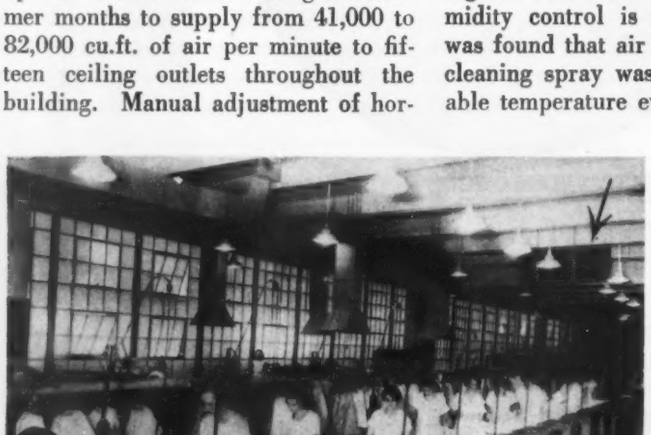
Both the large and small blower and washer installations are driven by three-speed induction motors. The smaller of the two is driven by a 20-hp. motor and is used during the summer months to supply from 41,000 to 82,000 cu.ft. of air per minute to fifteen ceiling outlets throughout the building. Manual adjustment of horizontal and vertical louvers in the ceiling outlets controls air movement in each section of the building. During the summer thermostatic and humidity control is not used, since it was found that air blown through the cleaning spray was held at a reasonable temperature even on hot days.

Blower and Air Washing Equipment at Knickerbocker Laundry

	(Summer) Larger 25-H hp., 3-Speed Motor Installation	(Winter) Smaller 20-H hp., 3-Speed Motor Installation	
		By Pass Closed	By Pass Open
Full Speed	90,000 cu.ft./min.	77,000 cu.ft./min.	82,000 cu.ft./min.
2nd Speed	60,000 cu.ft./min.	51,000 cu.ft./min.	54,500 cu.ft./min.
1st Speed	45,000 cu.ft./min.	38,500 cu.ft./min.	41,000 cu.ft./min.

Exhaust Units

	Capacity, cu.ft. per min.	H.P.
Shirt Dept.	8,600	2
Pressing Dept.	9,500	3
Washing Dept.	12,500	3
Washing Dept.	7,400	2
Dry Cleaning Dept.	3,800	1
Dry Cleaning Dept.	4,400	1
Office	3,700	—
Locker Room	8,300	3
Misc. Machinery	4,000	—
	61,700	15



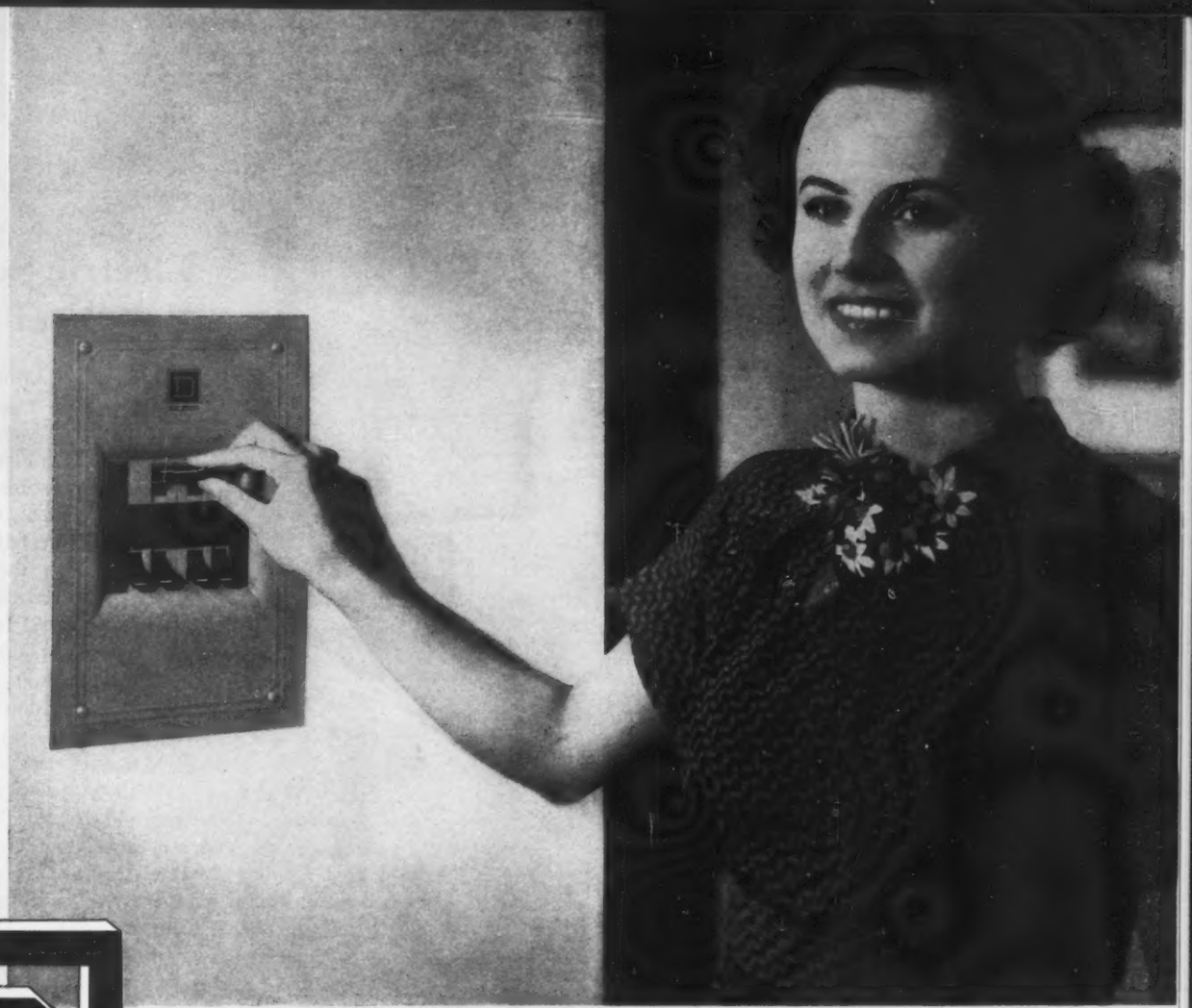
Modern ventilation system supplies conditioned air summer and winter in modern laundry. Adjustable louvers on inlet (arrow) control direction of air currents

Layout of air washing and blower equipment at Long Island laundry

During the winter months, however, when the larger installation (25 hp., 45,000 to 90,000 cu.ft. per minute) is used, both temperature and humidity control are necessary. A heating unit used with the air washer permits control of the temperature at which the air is saturated in the washer, and when used in conjunction with the reheater in the blower intake makes humidity control possible.

Capacity of the exhaust units which draw the moisture-laden air from the building is somewhat smaller than the capacity of the blower installation. Thus the air pressure in the building is slightly greater than atmosphere. This tends to prevent the infiltration of air and dirt from outside through cracks around windows and doors.

Greater efficiency and increased output have resulted from this installation. It is claimed that even during the hottest summer months heat prostrations are unknown and production is not slowed up by the necessity for additional rest periods despite the fact that the greater proportion of inside workers are women.



She didn't call a service man!
. . . she flipped the lever of a

MULTI-BREAKER LOAD CENTER

Service calls are costly to the Public Utilities, even when a service charge is made. Any long interruption of service means serious inconvenience to the customer, complaints and loss of revenue to the Power Company.

The Multi-breakeR load center eliminates many unnecessary service calls. It gives circuit breaker protection and branch circuit switching.

When the service entrance must be changed for the installation of an electric range, the customer will appreciate the addition of this modern convenience. The cost is little more than a good range switch and fuses and most customers will gladly pay the slight difference.

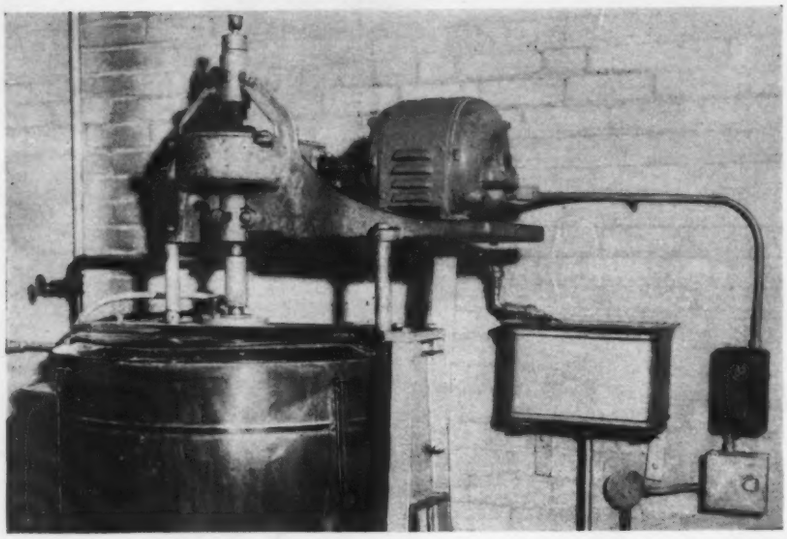
Built for either surface or flush mounting with 15 to 50 ampere branch circuits.

SQUARE D COMPANY

ETROIT - MILWAUKEE - LOS ANGELES

QUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

Call in a Square D Man



Direct drive through worm gearing cuts speed from 1,200 to 25 r.p.m.

Self-Contained Motor Drive for Glue Mixer

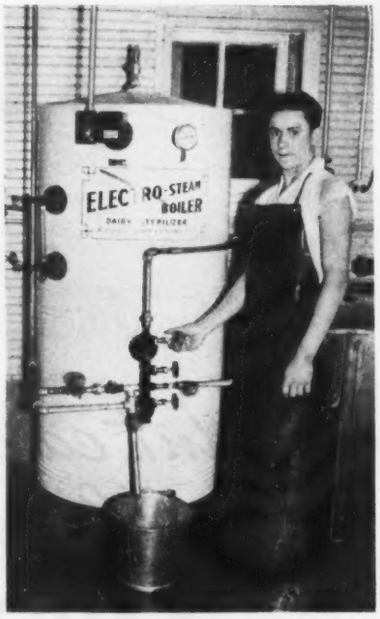
In moving to a new plant in Dedham, Mass., the Boston Envelope Company did away with overhead line shaft drives in all departments. A typical example of how well the individual motor drive fitted the new layout is shown herewith. The 50-gal. glue machine illustrated was formerly driven from a pulley on the bracket extension now occupied by a ½-hp. constant-speed United States motor. The new layout leaves the department clear of belting; no foreign matter can get into the agitator, and the drive is short, positive and accessible. The speed reduction is 1,200 revolutions per minute to 25, this ratio of 48 to 1 being obtained by worm gearing in the lubricator contained at the top of the machine.

•

Electric Boiler Supplies Dairy Steam

Hot water for washing bottles and cans and steam for sterilizing cans as well as for cooking buttermilk up to 180 deg. F. in a retail Grade A dairy near Portland is supplied by a 60-gal. electric steam boiler built primarily for dairies. The unit is provided with two 2-kw. units, but can be built up to 6 kw. when four 1,500-watt elements are provided. Control is by pressure switches rather than temperature, the setting being 55 and 65 lb.

Power for this type of installation on the lines of Portland General Electric Company, Portland, Ore., is sold on the 8-mill, off-peak, water-heating rate. This dairy uses 10,000 to 12,000 kw.hr. per year.



Steam for use in dairy provided by electric boiler operating on 8-mill off-peak rate

•

Electric Solder Pot Cuts Fuel Cost 50%

Practical elimination of rejects and a 50 per cent reduction in fuel costs have resulted from the electrification of one of the solder pots used in a continuous seam-soldering process at the Philips Can Co., Cambridge, Md.

The first electrification consisted of a G.E. midget thermostat controlling four 3-kw. Calrod heating units installed on a pot formerly heated with gas. This pot, 60 in. long, was especially insulated for the purpose. Through-the-side heaters were used because the surface layer of the acid flux is very corrosive.

Formerly the operating temperature was 650 deg. F. The uniform temperature distribution obtainable with electric heat allows a reduction of operating temperature to between 600 and 620 deg. F., thus contributing to a longer life for the crucible, a substantial reduction in dross and sludge formation and a reduction in radiation losses.

Automatic control relieves the operator of any responsibility for maintaining temperature and eliminates the need for adjusting the heat source. Pots are turned on automatically at 4 o'clock every morning and are ready for production when workmen arrive at 7 a.m. Under the present arrangement the pots are capable of seam-soldering 257 15-oz. cans a minute with almost no rejects.

Electrically heated pots seam-solder 257 cans a minute

NEW CUTLER-HAMMER 30 AMP.

FRONT-OPERATED ENTRANCE SWITCH

8 SMASH-HIT FEATURES!

SAFETY
DEAD-FRONT CONSTRUCTION

ENTIRE "WORKS" EASILY and QUICKLY REMOVED and REPLACED CONDUIT CONNECTED AND WIRES PULLED INTO EMPTY CASE

FRONT OPERATION
PERMITS COMPACT CONSTRUCTION
COMPACT MOUNTING IN BANKS

Cutler-Hammer announces a brand-new front-operated Meter Entrance Switch Bulletin 4331-H7, with 8 "Smash-Hit" Features:

1 Everything worked from front. Mount in compact banks.

2 Do all wire pulling, conduit and mounting work from front with empty case. Then slip interior assembly into place and tighten 4 screws. Permits maximum speed, maximum ease, maximum room.

3 Completely dead-front. 2 screws hold dead-front plate in place.

4 Reinforcing rib strengthens dead-front plate, also separates branch circuit fuse compartment from main fuses.

5 Opening door pulls main switch, deadens all fuses and exposed parts.

6 Branch circuit fuses tested through test slots without interrupting service.

7 Optional solid or neutral grounding.

8 Patented C-H troughing twist-out . . . easy to remove.

Switch is 30 Amp.—2 or 3 wire—1 or 2 main fuses, with 2 or 4 branch circuits. And of course there are plenty of convenient knock-outs. You'll find a ready market for Bull. 4331-H7 in new installations and remodeling and modernization jobs. Get full information at once. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1313 St. Paul Avenue, Milwaukee, Wisconsin.

CUTLER-HAMMER C-H SAFETY SWITCHES

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Cored Ground Wire for Supervisory

A so-called earth-core pilot system for supervisory and telemetering is a possibility not much explored. It was cited by William Wilson in discussion of a recent I.E.E. paper of G. A. Burns and T. R. Rayner on remote control of power networks (see *Journal of I.E.E.*, London, July, 1936).

The four core wires are contained in the center of an otherwise standard ground wire and thus involve no particular addition of weight and cost to the overhead line. The reliability of the pilot circuits, thus efficiently safeguarded both mechanically and electrically, is that attainable with ground wires generally. No specific installation was cited.

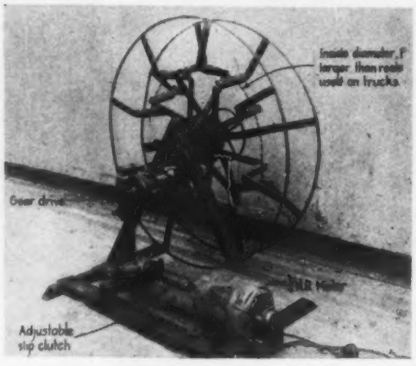
Dr. Wilson mentioned this as an attractive substitute for buried or leased circuits, which he finds often less reliable than the power circuits, and occasionally as costly in urban areas as the transmission line itself elsewhere.

•

Wind Salvaged Wire on Motorized Reel

By CARL R. WENZ
Assistant Superintendent of Construction
Oklahoma Gas & Electric Company

Development of a motor-driven winding device for use with a motorized wire stripper salvaging weatherproof conductor for the Oklahoma Gas & Electric Company presented unusual obstacles in design requirements. The winding device speed had to be synchronized with the speed of the wire-stripping machine. This problem was solved by the use of a slip clutch adjusted to any desired tension. The original gear ratio of the rewinding device conforms as nearly as possible to the average speed of the stripping machine, while the slip clutch compensates for the variation in the size of the wire coil as it increases on the winding reel.



Slip clutch holds tension on winding reel

Adjustment of the slip clutch allows sufficient tension to be applied to the wire as it is being wound on the reel to insure evenly rolled coils. The reel used on this rewinding device has an inside diameter one inch larger than the wire reels used on the service trucks. This facilitates the placing of the coils on the reel racks.

•

Simple Formula Gives Monthly Consumption

By H. E. EISENMENGER
New York Edison Company

Frequently it is desirable for executives and accountants to determine accurately the number of kilowatt-hours actually consumed during a certain calendar month for statistical purposes. Knowledge of this figure is indispensable in finding the efficiency between generating or substation and the consumer. The assumption cannot be made, however, that this figure will be equal to the kilowatt-hours read off from customers' meters during this same month (commonly called "kilowatt-hours sold") because the individual meter readings are spread out over the whole month and the consumption thus determined includes energy used during a portion of the preceding month. Only those meters read during the last day of the respective calendar month give exclusively the kilowatt-hours consumed during that month. We must thus distinguish between "kilowatt-hours read off" and "kilowatt-hours consumed."

Under the assumption that the load of the respective group of customers changes from the beginning of each month to the beginning of the next month according to the law of a straight line and that the number of meter readings every day (including Sunday) is the same, it is possible to derive a formula for the kilowatt-hours actually consumed during any calendar month and following two months. This formula can be shown to be equal to:

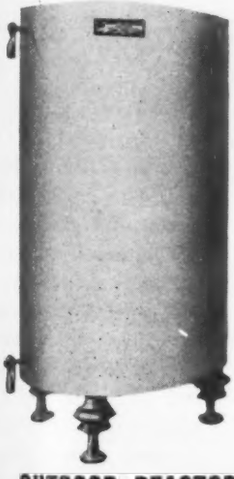
$$K_1 = A_1 R_{12} + B_1 R_1 + C_1 R_2 + D_1 R_3$$

in which K_1 equals the consumption during any calendar month and R_{12}, R_1, R_2 and R_3 are the meter readings of the preceding month, the month in question and the two succeeding months. The constants A_1, B_1, C_1, D_1 are constants depending on the number of days in the various months. These coefficients are to be taken from

IN SEATTLE—

AS IN MANY OTHER METROPOLITAN AREAS

MURRAY LOW LOSS REACTORS



OUTDOOR REACTOR
Conductor mounted in weatherproof housing

PROTECT PRIMARY DISTRIBUTION SYSTEMS

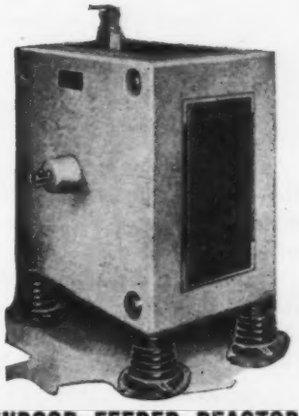
Murray Dry Type Current Limiting Reactors consist of concentric stranded, enameled and asbestos insulated conductors mounted in a concrete housing.

Current Limiting Reactors supplied for all kinds of services — indoor or outdoor — for operating voltages up to 33 K. V. and current ratings up to 5,000 amperes.

For over a quarter century Murray Reactors have been providing short circuit protection on the lines of many of the largest power systems.

Efficiencies guaranteed.

METROPOLITAN DEVICE CORPORATION
1250 ATLANTIC AVE.
BROOKLYN, NEW YORK



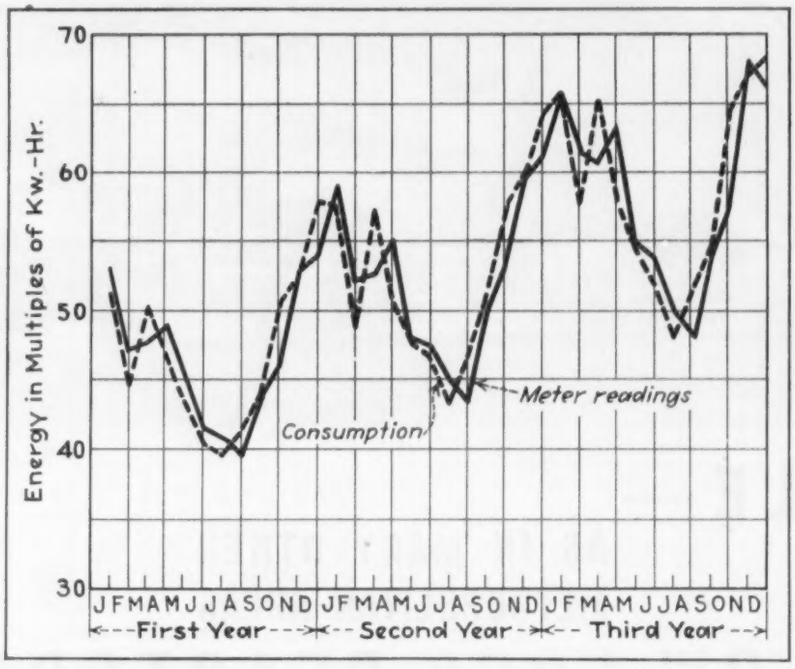
INDOOR FEEDER REACTOR
Conductor mounted in concrete housing

MURRAY LOW LOSS REACTORS

Coefficients for Calculating Monthly Kw.-Hr. Consumption

	$K_1 = A_1R_{12} + B_1R_1 + C_1R_2 + D_1R_3$ A	B	C	D
January	—0.1250	0.6186	0.6498	—0.1186
January, leap year	—0.1250	0.6208	0.6414	—0.1209
February	—0.1186	0.5932	0.6047	—0.1226
February, leap year	—0.1209	0.6042	0.6120	—0.1248
March	—0.1314	0.6611	0.6266	—0.1230
March, leap year	—0.1292	0.6480	0.6288	—0.1230
April	—0.1230	0.6148	0.6187	—0.1270
May	—0.1220	0.6352	0.6310	—0.1230
June	—0.1290	0.6148	0.6187	—0.1230
July	—0.1270	0.6373	0.6230	—0.1292
August	—0.1250	0.6230	0.6331	—0.1230
September	—0.1230	0.6148	0.6187	—0.1270
October	—0.1270	0.6352	0.6310	—0.1230
November	—0.1230	0.6148	0.6187	—0.1230
December	—0.1270	0.6373	0.6230	—0.1384
Dec. preceding a leap year	—0.1270	0.6373	0.6230	—0.133
Assuming equal lengths for all months	—0.125	0.6250	0.6250	—0.1250

Note: In the above table all values of A and D are negative. All other coefficients are positive.
K = Kilowatt-hours consumed during month. R = Kilowatt-hours read off during month.


70
60
50
40
30
Energy in Multiples of Kw.-Hr.
Meter readings
Consumption
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
First Year
Second Year
Third Year

Unadjusted meter readings lead to sizable errors in computing efficiency of transmission or distribution

Aggregate meter readings of the low-tension consumers of a large central station for three consecutive years (full line) and, superposed, the same values corrected to actual consumption during these months (dotted line). Kilowatt-hours read off showed a surprising peak every April, making the April readings higher than any prior readings except January. The correction as per the above formula (dotted line) reduces the shape of the curves to what we may expect: The April peak disappears entirely; the December and January consumptions are more nearly alike; February, in consequence of its shortness, shows a decided trough; the minimum occurs in July and not in August. A lag of the curve of readings behind the curve of consumption is plainly noticeable.

the line in the accompanying table which applies to the same month to which K_1 applies.

By making the assumptions that the difference between the readings R_{12} and R_1 will be negligible and likewise between the readings R_1 and R_2 and also by neglecting the differences in the lengths of the various months the values of the coefficients applied to R_1 and R_2 will approach the value of 0.5 and the above formula can be reduced to a rule of thumb, so that:

$$K_1 = \tfrac{1}{2}\,(R_1 \div R_3)$$

This means that as a rough approximation the kilowatt-hours during a certain calendar month is equal to the arithmetic mean between the aggregate meter readings of that month and the following month.

•

Nomogram Simplifies Belt Calculations

By W. F. SCHAPHORST
Newark, New Jersey

The old rule that a belt 1 in. wide will transmit 1 hp. for each 800-ft. per-minute belt velocity has been found inapplicable to modern short-center drives. The accompanying chart, which replaces the old rule, is based on the fact that the diameter of the smaller pulley has much to do with the belt width required to transmit a given horsepower.

This chart is applicable to all short-center drives and all flat-belt pulley ratios up to 6 to 1, belts being two ply and high quality. For long center drives the chart is even more accurate than for short distances.

To use this alignment chart run a line through the diameter of the smaller pulley indicated on scale A, and the belt speed in feet per minute, scale B, and locate the intersection on C. From this intersection on C run a second line through the horsepower to be transmitted on scale D. The intersection on scale E then gives proper belt width for either normal or heavy-duty load.

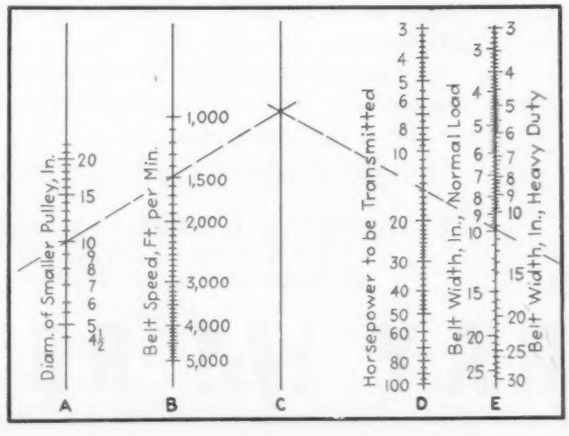
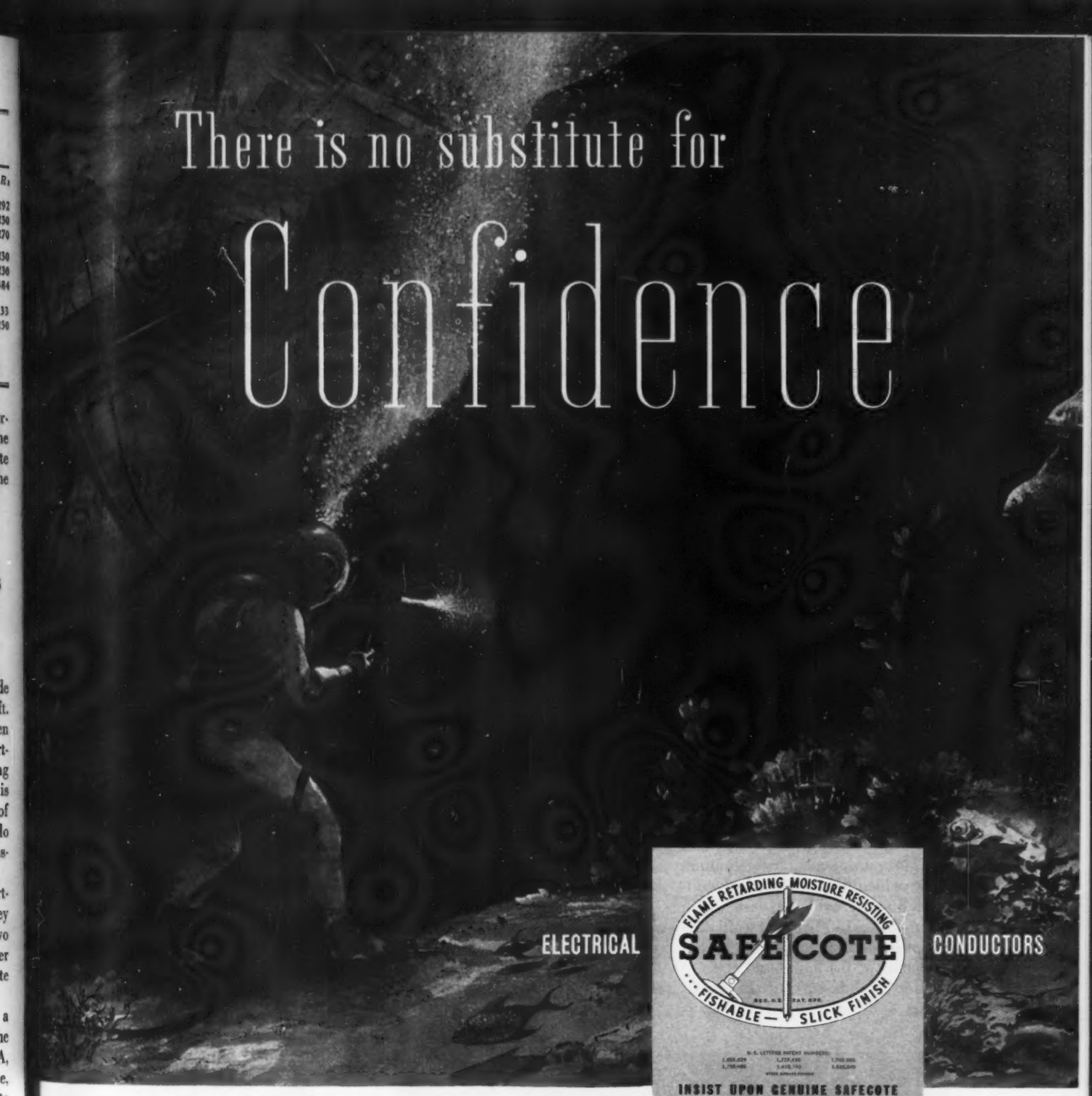


Chart yields data on short-center belt drives



No amount of Advertising . . . no amount of salesmanship . . . will gain you a single customer unless that customer has confidence in you and in the goods you sell

THERE IS NO SUBSTITUTE FOR SAFECOTE

Built and tested to Safecote standards by these leading wire manufacturers

American Steel & Wire Company
Anaconda Wire & Cable Company
The M. B. Austin Company
Bishop Wire & Cable Corporation
Clifton Conduit Company
Collyer Insulated Wire Company
Crescent Insulated Wire & Cable Co.
General Cable Corporation
General Electric Company
Habirshaw Cable & Wire Corporation
Hazard Insulated Wire Works Div. Okonite Co.
National Electric Products Corporation
Paranite Wire & Cable Company
Providence Insulated Wire Company
John A. Roebling's Sons Company
Simplex Wire & Cable Company
Triangle Conduit & Cable Co., Inc.
United States Rubber Products, Inc.

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GEORGE C. RICHARDS, LICENSOR'S AGENT • 155 EAST 44th STREET, NEW YORK CITY

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers

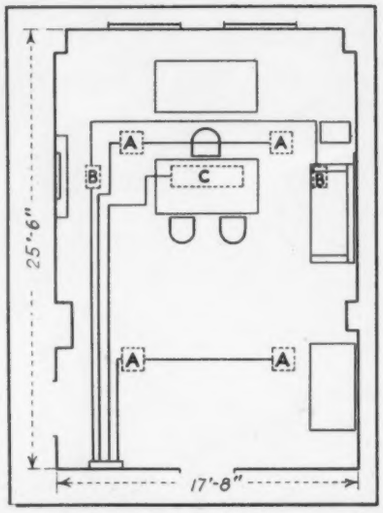
Improve Office Light With Built-In Units

Satisfactory lighting for executive offices is not altogether easy to attain. This is indicated by the fact that it took Holophane Company's president twenty years to find the installation and then only after he had seen it in the office of a New York architect.

General illumination for his office of 10 or 15 foot-candles, provided by four symmetrically placed flush ceiling units, each housing one 150- or 200-watt inside frosted daylight lamp, is supplemented by plus-light values of 50, 30 or 20 foot-candles on the office desk. This supplementary illumination is provided by a special flush ceiling unit directly over the desk which uses four 200-, 150- or 100-watt daylight lamps, depending on the seeing requirements of the individual.

An additional feature of the installation is a curtain of light that is thrown on wall decorations by two flush ceiling units near the side wall. Each of these units, like the others, utilizes prismatic "controlenses" to direct the light provided by the two 150 lamps. Use of these units brings out important wall decorations heretofore lighted by unsightly individual lights mounted on picture frames themselves.

In addition to supplying the high illumination necessary for close and exacting work, this installation fits the architecture of the room to produce what this executive describes as "the most satisfying thing in my office."



Carefully placed units provide illumination where needed in private office

Independently controlled units (A) provide general illumination, while large built-in fixture (C) over desk gives high intensity on working plane. Units near wall surface (B) throw curtain of light on important decorations.

Flexible office illumination provided by built-in ceiling units

Electric Boilers as Load Builders

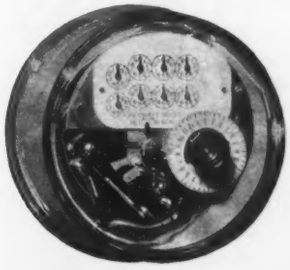
By H. R. STEVENSON
Detroit Edison Company
Detroit, Mich.

There are many service and commercial operations, such as hat blocking, clothes pressing, cloth sponging and the like, that require comparatively small amounts of low-pressure steam. It is manifestly uneconomical to supply steam for such uses piped from fuel-heated boilers because the smallest available boiler is usually much too large, and to generate the steam by fuel at the place of its use often invites a high insurance rate.

It has been found by the power sales department of the Detroit Edison Company that such occasional and small uses for steam are practically made to order for electric heat. A boiler of five quarts water capacity with a 3-kw. heating unit is about the best combination. The heating unit is large enough and the amount of water small enough so that steam is available almost on demand.

HELP KEEP THIS CURVE GOING UP

Sangamo Type HV-A
Conventional Mounting



Sangamo Type HV-S-2
Socket Mounting

Modern Loads Need Modern Meters

One of the outstanding factors in the upward trend of power consumption is the increased use of electricity in the home—with off-peak water heating contributing an important part.

To measure accurately, and to control these off-peak loads, a complete line of Sangamo Combination Meters and Time-switches is available, fulfilling the requirements of any off-peak rate.

Sangamo Types HV-A and HV-S are designed for simple off-peak rates. Types HV-A-2 and HV-S-2 are for two-rate metering. Any of these meters are supplied for single-pole, single-throw; or double-pole, single-throw; time-switch operation.

Bulletin No. 90 contains the detailed description.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Above—Inadequate illumination of 4.9 foot-candles, incorrect location of fixtures, and work in deep shadows. Below—Fixtures are shown in correct position to avoid shadows and eliminate excessive metal reflection from the work and an intensity of 40 foot-candles

Better Lighting for Buffing Room

Industrial lighting installation should be designed for the work to be done under it. Lighting in many work areas throughout industry departs very widely from this common-sense requirement. These pictures, however, illustrate a recent example of what can be done in the way of intelligent application of light in industry. In the above illustration it is shown how the buffing room in the plant of the Colonial-Premier Company, Chicago, used to look with its 4.9 foot-candles of average illumination. The reflectors were too flat and the units too close to the work. The angle of light on the surfaces of the shining plated vacuum cleaner parts being polished reflected the maximum glare into workers' eyes. It would be hard to make any one admit designing such a superlatively wrong lighting installation. It must have just grown.

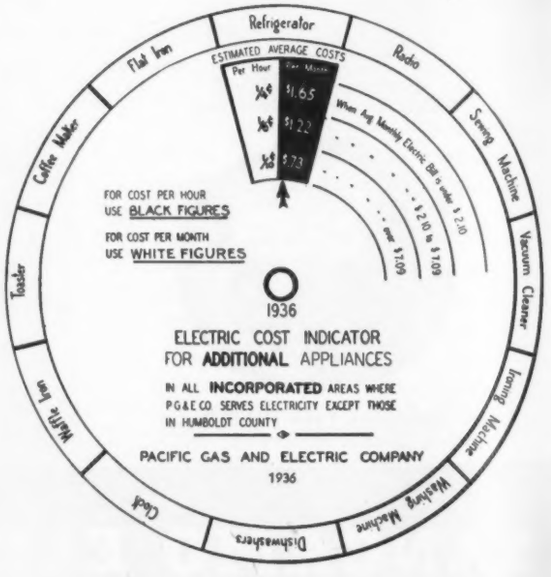
Now see in the illustration below the same room after the lighting engineers of the Commonwealth Edison Company made it a bright, cheerful, efficient place to work. The illumination is raised to 40 foot-candles. There are no sharp contrasts of bright light and black darkness to tire the eyes. The higher position of the modern units minimizes reflected glare from the shiny plated surfaces. Is it not apparent that the work is easier and that production is better and faster?

Calculator Gives Appliance Costs

While the most common question asked by the prospect is "How much will it cost," appliance salesmen in the territory of Pacific Gas & Electric Company serving northern California no longer have to temporize or hedge in answering the question. Neither is there any excuse for the salesman to set the operating cost too low and thereby make a dissatisfied user. A simple, inexpensive device eliminates both guesswork and laborious calculations from the methods of answering prospects' questions as to cost of appliances.

The device consists of a large outer disk around the circumference of which are listed the various types of appliances. Two smaller disks, each with a window, rotate on either side of the larger circle. As the window moves under the appliance the estimated average cost per hour and per month for that particular appliance are shown for three different average monthly bills. One side of the calculator gives the rates for all incorporated areas in the Pacific Gas & Electric Company territory and the other side estimated costs for the unincorporated areas, which have but slightly higher rates.

The device is easy to use and surprisingly accurate if properly used.



Circulator calculator which provides easy access to operating costs of various appliances

Specify

DURONZE... MODERN HIGH-STRENGTH, ACID-RESISTING SILICON-BRONZES

DURONZE... FOR PARTS THAT DARE NOT FAIL

DURONZE is outstanding among non-ferrous metals. It makes possible manufactured products of all kinds with parts that are immune to premature failures due to rapid corrosion, season-cracking, or lack of strength.

Pioneered by Bridgeport, Duronze is a high-strength, acid-resisting silicon-bronze — an electric furnace product. Bolts made of this material average approximately 100,000 lbs. per sq. in. tensile strength. Duronze resists the action of corrosive waters and weathering better than brass and most other alloys. It withstands continuous stresses and fatigue. Easily workable yet surprisingly low in cost.

Duronze is available in rod, sheet, wire, tubing and in ingot form. We will gladly put you in touch with manufacturers of Duronze screws, bolts, pole-line hardware, high-strength forgings, pump rods, lock washers, screw machine parts, turn-buckles for tie-rods, etc., or supply samples for experimental purposes. Write for booklet.

BRIDGEPORT BRASS COMPANY

BRIDGEPORT, CONN. ESTABLISHED 1865

"Bridgeport" TRADE MARK

BRIDGEPORT

News ABOUT PEOPLE

E. W. Robinson Appointed to New Executive Position

E. W. Robinson has been appointed operating manager of the Alabama Power Company, a new position created to co-ordinate more effectively the operations of the company. He will have general charge of production, transmission, distribution and operating engineering departments. Mr. Robinson's long service and experience eminently qualify him for the greater responsibilities of the new position.

It was in 1923 that Mr. Robinson became associated with the Alabama Power Company as electrical engineer. Subsequently he was made assistant superintendent of distribution, super-

intendent of distribution and then finally superintendent of transmission and distribution.

He started his engineering career with the manufacturing branch of the electrical industry, as apprentice engineer for the Westinghouse Electric & Manufacturing Company. In 1913 he joined the E. W. Clark & Company Management Corporation, Columbus, O., as power sales engineer and after various assignments his duties gradually expanded to include electrical and hydraulic specifications, design and purchasing for subsidiary operating companies.

In 1919 he left E. W. Clark Company to engage in electrical supply business at Chattanooga, but returned in 1920 to the Clark organization as assistant chief engineer handling the same duties as previously. He then went with Alabama Power.

•

► ALEX DOW, president of the Detroit Edison Company, was recently elected a trustee of the Rackham Engineering Foundation. An item covering the incorporation of the Foundation was published in ELECTRICAL WORLD, July 18, page 108.

► W. W. BROOKS, formerly electrical engineering research assistant, University of Illinois, Urbana, now is connected with the General Electric Company, Erie, Pa.

► F. L. BOISSONNAULT, formerly a control engineer for the Westinghouse Electric & Manufacturing Company in San Francisco, Calif., was recently appointed electrical engineer for the Department of Water and Power of the City of Los Angeles.

► BEN H. PARKINSON, recently sales manager for the Portland Gas & Coke Company, Portland, Ore., and well known in the electric utility industry in the Northwest through his previous long association with Pacific Power & Light Company, resigned September 1 to take a position with the North Coast Electric Company of Seattle and Portland as sales promotion representative in Oregon and Washington for Norge electric and gas appliances. North Coast Electric is distributor for these appliances in this territory. In his new position he will make his headquarters in Seattle.

J. E. Buckingham Assumes New Executive Duties

Lincoln Electric Railway Sales Company, Cleveland, Ohio, announces the election of J. E. Buckingham as vice-president in charge of sales for the western district with headquarters in

Chicago, Ill. For the past fourteen years Mr. Buckingham has been connected with the Worthington Pump & Machinery Corporation in its railroad sales department.

The Lincoln Electric Railway Sales Company was appointed several years ago by the Lincoln Electric Company, Cleveland, Ohio, as exclusive railroad sales representatives covering their entire line of "Shield Arc" welders, electrodes and motors. Their continuous growth has necessitated repeated expansion and Mr. Buckingham will continue to expand the western organization as necessary.

•

► FREDERICK BEDELL, formerly professor of physics, Cornell University, has resigned to enter the R. C. Burt Scientific Laboratories, Pasadena, Calif. Doctor Bedell was appointed professor of physics on the staff at Cornell in

HOW KANSAS CITY POWER & LIGHT COMPANY CUTS BAD DEBT LOSSES TO

8/100ths of one percent

One clerk can handle detail on more than 30,000 accounts—posting, proving, changing, balancing, passing all credits, serving as an information source.

KEEPING bad debt losses down to 8/100 of one percent is worthwhile for any utility! Yet the Kansas City Power & Light Company does it . . . and averages only one collector for every twenty-four thousand accounts (including active, inactive and merchandise collections as well as non-payment cutoffs).

Admittedly one of the important factors in this fine showing is their Remington Rand Customer History Record. This unique record takes all the facts about each customer from several different sources and puts them on one visible card. By an exclusive system (which groups similar sounding names), finding and reference time is cut 50% to 60% . . . errors reduced to a minimum.

With the help of the Customer History Record you can have complete information on any customer in *fifteen seconds*. Collection expense is reduced at least 50% because this record tells you definitely which accounts need collection effort . . . and which do not. In addition wherever the Customer History Record has been installed, it has brought to light large amounts of previous bad debt losses which could be either transferred to current accounts or liquidated through the application of unclaimed or inactive deposits. Frequently this recovery alone equals the total cost of installing the complete record.

A genuine help in keeping customers happy, too

Find out today what this Customer History Record could do to improve public relations and bring increased savings for your company. Trained supervisors see to it that installation does not upset the routine of any department. Phone your Remington Rand office or mail the coupon for complete story in interesting new visual form.

OK.. it's from Remington Rand

Remington Rand Inc., Public Utility Dept. U-194
465 Washington Street, Buffalo, N. Y.

I would be interested in seeing your new visual presentation showing what the Customer History Record is doing for other utilities.

Name.....

Company Name.....

Address.....

City.....State.....

1904. A fellow of the American Institute of Electrical Engineers, he has contributed his services liberally to that organization. He served as manager, 1914-16; vice-president, 1917-18; and as a member of many of its technical committees. He is the author of many papers presented before the Institute, and of various technical books.

▶ A. S. HARRINGTON, consulting engineer of Omaha, Nebr., has been appointed manager of the Middle Loup public power and irrigation district.

▶ S. B. HARDIN, formerly line material specialist of Graybar Electric Company at Kansas City, has been appointed sales manager at Denver. Mr. Hardin started with Graybar at Kansas City in 1917 and he has worked his way up through the sales department to his present position.

▶ WILLIAM A. REDSHAW, superintendent of electric distribution in the New Brunswick district for Public Service Electric & Gas Company, Newark, N. J., is celebrating his fiftieth anniversary with the utility this month. He will receive a diamond-studded gold badge from the company. Mr. Redshaw will be given a testimonial dinner by his fellow employees on October 15 when he returns from his vacation.

ANCHORS AWEIGH

Carl S. Herrmann, president of the New England Power Association, joins the overseas trek with a Mediterranean objective, but he will be home in time to vote

▶ WILLIAM R. LUNK, until recently secretary of the Auburn (N. Y.) Chamber of Commerce, has joined the staff of the Monongahela West Penn Public Service Company to promote development along business and industrial lines in northern West Virginia and to co-ordinate this work with agricultural activities. Mr. Lunk's duties will include working with chambers of commerce, boards of trade, and community and business organizations with the idea of aiding and supplementing their activities to bring new industries to the region and promote trade.

▶ FRANK H. GOLDING, president of the New England Gas & Electric Association, Cambridge, Mass., has been elected president of the Cambridge Port Savings Bank.

▶ N. A. NAYLOR, until recently eastern sales manager of General Controls Company, has become associated with the Spencer Thermostat Company, Attleboro, Mass., to take charge of its new branch office in Cleveland, Ohio. Mr. Naylor, formerly of San Francisco, is a graduate engineer of University of California, and has spent most of his time in the heating and automatic temperature control field.

▶ ALLISON R. WILLIAMS has been appointed chief of the division of rates, costs and valuations of the engineering bureau of the Federal Power Commission, Washington, D. C. This division handles all engineering features of rate and contract cases and national rate statistics. Mr. Williams has been with the Federal Power Commission for the past two years as rate specialist. He is a graduate of Massachusetts Institute of Technology. Prior to his connection with the Federal Power Commission he was engaged in consulting engineering and utility management in the south. He is a fellow of the American Institute of Electrical Engineers.

Pioneers Visit Edison Foundation Booth

Wide World

A number of men who worked under the late Thomas A. Edison visited the Thomas A. Edison Foundation Booth at the Radio and Electrical Show held at Grand Central Palace, New York. H. A. Campbell (second from left) shows a model of the machine he helped install in the first electric lighting plant on Pearl Street. At his left is W. S. Mallory, and at his right are J. F. McCoy and F. D. Potter, all former Edison assistants.

OBITUARY

▶ LOUIS F. PHILO, manager of the Westinghouse Electric Supply Company at Houston, Tex., died August 31 in his sixty-fourth year. Mr. Philo had been manager of the Westinghouse company since 1928.

▶ UMBERTO BONE, one of the leading Italian authorities on the construction of hydro-electric power stations, died recently at Brescia, Italy.

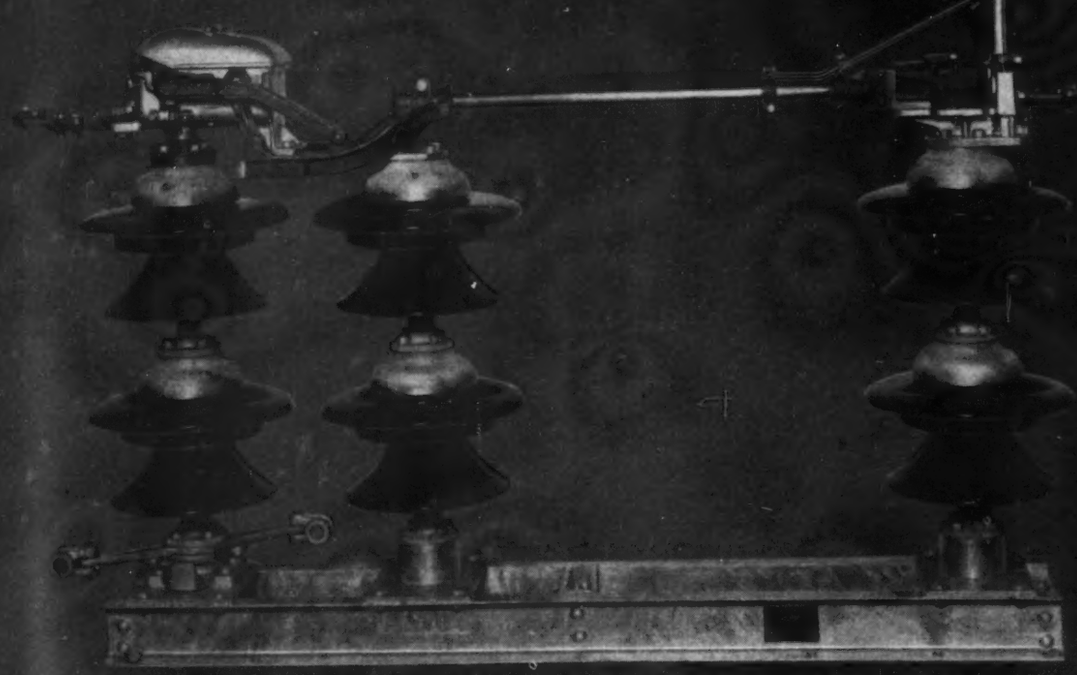
▶ GEORGE H. STACK, retired utility executive, died September 10 at the age of 71 in Utica, N. Y. Mr. Stack had retired as vice-president, treasurer and director of Utica Gas & Electric Company in 1932. He had also been an officer of several other utility properties in up-state New York.

ENOUGH BETTER

IN

PERFORMANCE
DEPENDABILITY
ENDURANCE
DESIGN
PRECISION

HI-VOLTAGE EQUIPMENT MERITS FIRST CONSIDERATION



TYPE C-W 46 KV to 69 KV Air Break Switch

Write for Bulletin No. 26

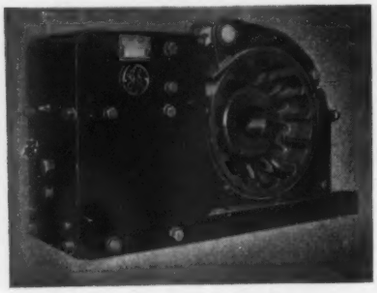
HI-VOLTAGE EQUIPMENT CO.

2891 EAST 79TH ST., CLEVELAND, OHIO

New EQUIPMENT AVAILABLE

Three-Shoe Magnet Brake

Mounting flexibility of two-shoe brakes is said to be combined with the braking surface protection of band-type brakes in this three-shoe, spring-set, d.c. magnet brake. It is intended for use where it is



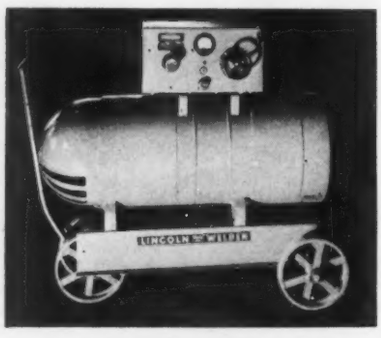
Type CR9523 three-shoe brake. **General Electric Co.**, Schenectady, N. Y.

necessary to stop and hold a load at the motor armature, as in cranes, hoists, conveyors and steel mill machinery. Desired braking characteristics are secured by adjusting the position of the self-aligning brake shoes and the compression of the spring. Positive operation under mill service conditions is said to be assured by the clapper-type magnet used in the actuating mechanism.

•

Dual Arc Control Welder

A new line of single operator arc welders newly announced features a new method of arc control which makes possible the adjustment of both arc heat and arc penetration in a continuous sequence of fine increments. The new welder permits the use of the correct voltage and current for all classes of work in the range of each size of machine. In all types of welding machines heretofore it has been impossible to get these continuous adjustments, resulting in a compromise setting. It is claimed that this new machine with its wide range of setting of both voltage and current results in the most satisfactory welder performance possible.

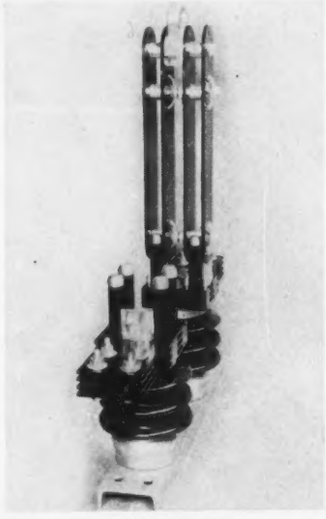


"Shield Arc SAE" welder; available sizes: a.c. motor driven 200, 300, 400, and 600 amp.; d.c. motor driven, 300, 400, and 600 amp.; generator for belt or couple service, 200, 300, 400 and 600 amp.; engine driven, 200, 300, and 400 amp. **Lincoln Electric Co.**, Cleveland, Ohio.

•

High-Tension Switch

Silver insert buttons are used for the contact-making parts of this new, high-tension, disconnecting switch. When the switch is closed, these buttons come in contact with similar insert buttons at



"Silver Ball" high-tension switch; 2,000 amp., 7,500 volts. **Powercraft Corp.**, St. Louis, Missouri.

opposite ends of the diameters of the balls set between the blades and mounted on the switch terminals. Cool operation, adjustable and renewable silver contacts, lacquer-finished copper parts to eliminate corrosion, are features claimed for this switch.

•

Tree Trimmer

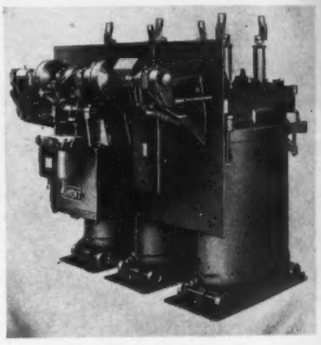
Compound lever tree trimmer with maximum cutting capacity of 1¼ inch branch. **Tips Tool Co.**, Taylorville, Ill.

Pulley in new tree trimmer enables operator to pull at any angle. Lever system designed not to interfere with cutting in small open spaces. Poles are 1½ inch diameter and in lengths 4 to 16 feet, one piece or jointed.

•

Oil Circuit Breakers

Two new indoor, station-type, oil circuit breakers have recently been introduced which feature interrupting devices called



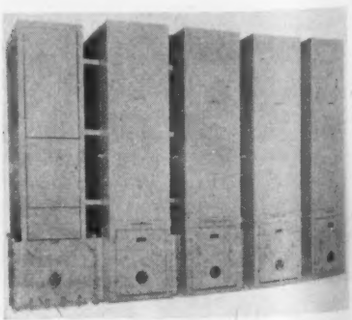
Type F2-220: Interrupting capacities 500,000 to 2,500,000 kva.; voltage rating 15 to 34.5 kv. Type F2-210: Interrupting capacities 250,000 kva. for 600, 1200 and 2,000 amp. at 15 kv. (shown). **Condit Electrical Mfg. Corp.**, Boston, Mass.

Ruptors. These devices are said to give quick cleaning of short circuits along with low arc energy, low pressure and a minimum of oil deterioration. Other features include: — low-inertia, high-speed mechanisms; internal oil-type shock absorbers; silver-plated contacts; and oil-gas separators.

•

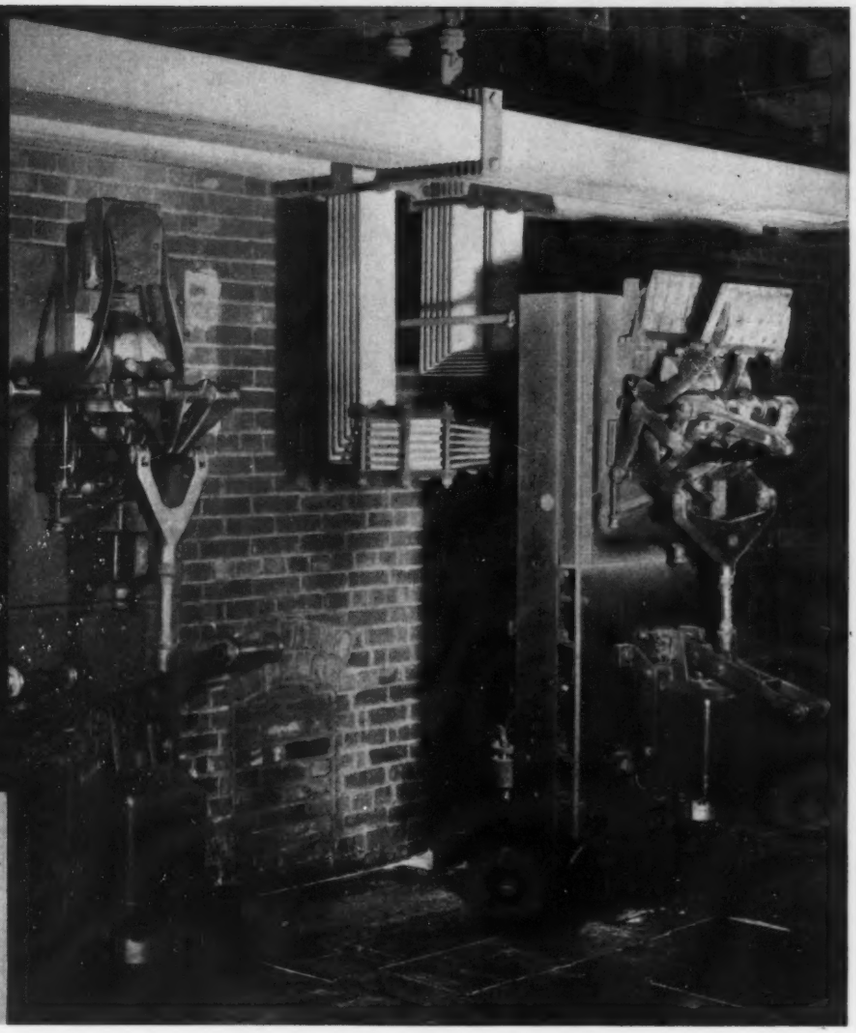
Metal-Clad Switchgear

This switchgear installation, intended for industrial service, may be operated from a distant point. Each of the four units on



Metal-clad switchgear for industrial service; 7.5 kv. **Delta-Star Electric Co.**, Chicago, Ill.

Aluminum BUSSES *are* BETTER



Right: 550-volt, 10,000 amp. breaker, installed 1914. Joints are Aluminum to Aluminum to copper. In 22 years of service, no trouble has ever been experienced with these joints.

Any way you look at it . . .

. . . as a matter of expense,

. . . as a matter of convenience,

. . . as a matter of engineering efficiency.

Because it is at least 52% lighter, it can be handled more easily and often installed up on roof trusses . . . out of the way and with a minimum of supports.

Efficient taps, joints, and splices can be made by bolting, or by an easy welding technique.

Fittings are simple and inexpensive.

In addition to flat, angle and tubular bus, you may have Channeluminum which provides mechanical strength and rigidity for long unsupported runs, as well as thermal and electrical efficiency appreciably better than in any other type bus for very heavy loads. Channeluminum plus flats, angles and tubes of Alcoa Aluminum meet every mechanical and electrical design requirement.

Even corrosion is beaten from the start with Aluminum bus, because Aluminum is inherently resistant to plating room fumes and sulphur-laden industrial atmosphere; it requires no special protection.

For full information concerning the economy and convenience of Alcoa Aluminum bus bar, write to: ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh, Pennsylvania.

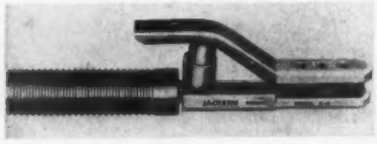
ALCOA · ALUMINUM

the left has a three pole, 800-amp., solenoid-operated oil circuit breaker with its current transformers, relays and plug disconnectors with their interlocks. Top compartments contain the main bus. Right-hand unit houses three potential transformers and a three-pole group-operated disconnecting switch interlocked with a door. Fuses mounted on the switch frame are equipped with limiting resistors.

•

Welding Electrode Holder

An improvement has been effected in welding electrode holders of this make through the use of a copper alloy—No. 3 Mallory metal—for the jaws of the holder. This metal, combining conductivity and



Welding electrode holder. Model A-2. **Jackson Electrode Holder,** Detroit, Mich.

resistance to corrosion with strength, has been found especially suitable for flash welding dies, spot welding tips and seam welding wheels. Other features of the holder have been retained.

•

Pocket Instruments

Voltmeters, ammeters, milliammeters, designated Type AS-5. Dimensions, 5⅛x3⅛x2, weight 12 ounces. **General Electric Company,** Schenectady, N. Y.

Light weight, these new instruments have new high torque element with accuracy of 1%. Damping is magnetic and shielding is provided. On multiple-range instrument, a switch is provided to avoid need for changing connections.

•

Air Circuit Breakers

High interrupting capacity is claimed for these new solid-contact air circuit breakers which incorporate the principle of one contact per pole. The primary contact is stationary, being mounted on the panel, and the moving arm makes contact with it, completing the circuit. Existence of but one contact per pole is said to reduce resistance and heating losses to a minimum.

Type BD: Interrupting rating: 40,000 amp., 600 volts. Sizes available: 600 amp. and below, 600 volts a.c., 750 volts d.c. Hand or electrically operated. **Roller Smith Co.,** New York City.

High opening speed is attained since the moving arm carries no primary contact, it is claimed. Metallic arcing tips combine moderate ohmic resistance with arcing and wear-resistant qualities.

•

Round Chart Graphics

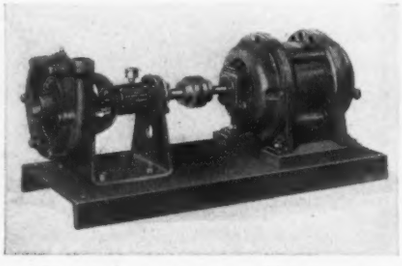
Recording voltmeters and ammeters, spring or Telechron clock drive. **The Bristol Company,** Waterbury, Conn.

Accuracy and ruggedness are design features of a new line of round type recorders offered in models for wall, switch-board, flush panel and pole mounting as well as portable use. Aluminum alloy cases exclude dust, fumes and moisture. Platinum point pens are used. Adjusted for public utility and industrial service.

•

Small Centrifugal Pumps

These small centrifugal pumps are designed for water supply, circulation, construction work and pumping on farms and feature simplicity of design and compactness of unit. Two ball bearings support the shaft and are inclosed in a dirt and



Centrifugal pump; motor sizes from ¼ to 3 hp., delivering from 10 to 130 g.p.m with heads from 10 to 100 ft.; direct motor drive, or pulleys for belt drive. **Worthington Pump & Machinery Corp.,** Harrison, N. J.

moisture-proof housing. The suction head may be removed for inspection of the pump's interior.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

ELECTRIC FURNACES AND MELTING POTS—Dimensions and ratings of high-temperature electric furnaces with atmosphere control are given in bulletin TB-26. Similar information is furnished on electric melting and pouring pots, designed for babbitt, solder, tin, type metal or lead, and for continuous service and temperature up to 1,000 deg. F., in bulletin TD-11. Both of these are issued by the Harold E. Trent Company, 618-40 North 54th Street, Philadelphia, Pa.

LUMINOUS-TUBE TRANSFORMERS — Transformers and allied equipment for luminous-tube signs are fully discussed in bulletin GEA-1305D of the General Electric Company, Schenectady, N. Y. This 40-page, illustrated booklet describes the operating and construction features, and gives complete dimensions, technical data including ratings, and weights of this line of transformers, time switches, neon-sign cables and rotary converters. Power-factor improvement curves aid in selecting the proper transformer for particular requirements.

ELECTRIC-HEATED STEAM BOILERS—Bulletin 52B, published by the Commonwealth Electric & Manufacturing Company, 83-105 Boston Street, Boston, Mass., discusses 2- to 24-kw. electric-heated steam generators and optional extra devices. Pictures of these units, their ratings, dimensions and weights, and typical installations are included in the 8-page booklet.

CENTRIFUGAL PUMPS—Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued leaflet 2224 on its single-suction and inlet centrifugal pumps, for use in an inclined, vertical or horizontal position. In addition to showing the general construction features, with dimension tables, the leaflet shows a number of typical combination drives for these bronze-fitted pumps.

STREET LIGHTING—New light-weight luminaires for street lighting are described in bulletin GEA-2276A issued by the General Electric Company, Schenectady, N. Y. This 4-page folder pictures the mechanical features of the lights and gives information on their installation and maintenance as well as dimensions and ordering data. Charts show the candle-power distribution and efficiency of the lamp.

LIGHTING EQUIPMENT—Power and light companies may be interested in big-wattage lighting equipment discussed in catalog 40 of the Kliegl Brothers Universal Electric Stage Lighting Company, Inc., 321 West 50th Street, New York, N. Y. Detailed information, including installation pictures, specifications and uses of this line of theatrical, decorative and spectacular lighting equipment, is given in the 96-page publication.

AERIAL CABLE—Bulletin GEA-2408 of the General Electric Company, Schenectady, N. Y., is devoted to self-supporting aerial cable, designed for use on urban, suburban and rural circuits. Description of construction features, and technical data, including dimensions and weights, are included in the 8-page booklet. Typical installations are pictured and this entire line of cable is listed.

SPEED REDUCERS—Right-angle speed reducers are discussed in bulletin 2100 and parallel-shaft speed reducers in bulletin 1100, both issued by the Falk Corporation, Milwaukee, Wis. Specifications, A.G.M.A. ratings, service factors and directions for selecting, dimensions and applications are furnished for both types of reducers.

NEW FUSE CUTOUT; FLOODLIGHTS—Line-suspension fuse cutouts for rural lines are described in bulletin GEA-2328, with special reference to construction details, their attachment and removal from the line and their dimensions. Bulletin GEA-2357 gives dimensions and available mounting and bases for three floodlights, 300/500 watts, 750/1,000 watts and 1,500 watts. Both are issued by the General Electric Company, Schenectady, N. Y.

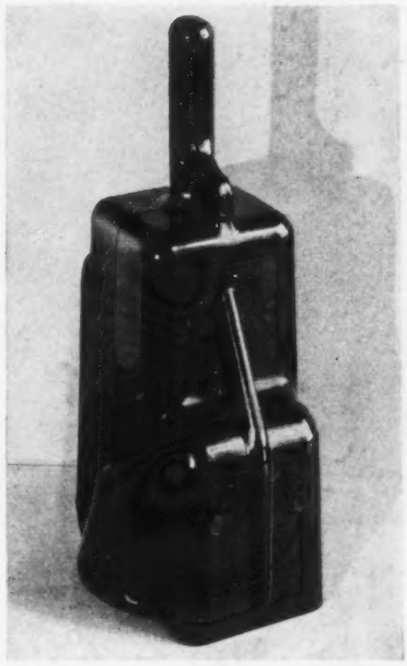
MOTOR CONTROLS — Monitor Controller Company, Gay, Lombard and Frederick Streets, Baltimore, Md., has issued a series of bulletins on direct- and alternating-current controllers and accessories. Each bulletin gives a general description, characteristic features, dimensional and rating data of a particular device. They are individually classified in bulletin 1000.

Where Safety Demands *Versatile Insulation..*

FOR a wide variety of electrical devices and equipment parts, resistivity and dielectric strength are not the sole factors by which the value of insulation can be judged. The mechanical and chemical properties of an insulating material often are as important as its electrical characteristics.

That is why Bakelite Molded has broad application throughout the electric light and power industry. Combined with its electrical advantages are unusual durability features. Its high resistance to moisture, weathering, oils, chemicals, wear and mechanical stress insure lasting safety to operators and equipment where it is employed as insulation.

A typical example is the Disconnect Switch Clip Guard pictured. Completely formed from Bakelite Molded, this device safeguards operators, prevents accidental closing of circuits, and withstands the repeated handling, perspiration and other normal abuses of such service. The light weight, and ease of forming this material into irregular, thin-walled shapes, are important added advantages.



Other examples of the versatile service of Bakelite Molded are common throughout modern electrical generation and transmission systems. Electrical engineers and designers are invited to write for booklet 3M, "Bakelite Molded", which provides technical data on the numerous types of Bakelite Molded available.

(Left) 4,800 volt disconnect switches protected by Bakelite Molded Clip Guards. (Above) Clip guards completely formed in one press operation from Bakelite Molded. Produced for Detroit Edison Co.

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

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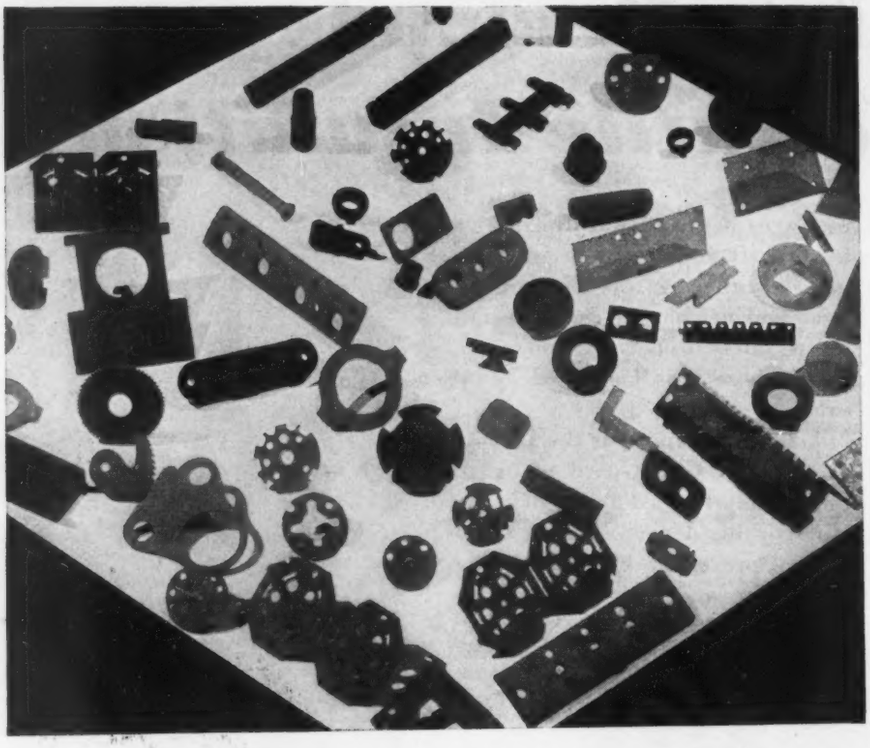
The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

THE MATERIAL OF A THOUSAND USES



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When the question arises as to adaptability and economy of various insulating materials you can get an unbiased authoritative answer from Continental-Diamond. We make insulating materials of many types and we can therefore recommend the appropriate material for your particular use.

DIAMOND VULCANIZED FIBRE—an extremely tough vulcanized fibre having high electrical insulating properties. **DILECTO**—(phenol fibre), a laminated phenolic insulating material. **MICABOND**—Mica in its most usable form. **VULCOID**—a non-hygroscopic economical insulating material. **DIAMOND INSULATION**—a thin tough flexible vulcanized fibre, with exceptionally high insulating properties, which will stand extreme bending.

These insulating materials are all products of Continental-Diamond research—known and recognized by their trade names—used throughout all industries—accepted, proved materials, each of which has been developed to meet specific conditions. We invite inquiries—let us send you complete catalogs on each of these Continental-Diamond insulating materials.

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NEWARK DELAWARE

Municipal Plants

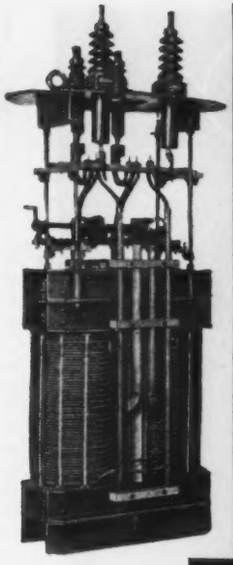
SEAFORD, DEL.—Another step has been taken in Seaford's fight to own and operate its own electric plant. City Council has granted a 20-year franchise to the Seaford Light & Power Company to build and operate a power plant with optional clauses which give the city the right to buy the plant within five years. The company awarded the franchise was one of the joint defendants with the City Council in temporary injunction proceedings instituted recently by the Eastern Shore Public Service Company, whose franchise had expired. The latter company, which has been leading a fight in the courts against the plans of the Seaford officials for the last two years, was denied the temporary injunction which would have held up the franchise just granted. The terms of the franchise require the company to erect and operate a modern power plant for which they pay the town $2,500 a year. City Council is to have the privilege, within the first five years of the franchise to purchase the plant for municipal operation at cost price, with the provision that the total net profits, realized by the company up to the time when the city takes it over, be applied as a part payment on the purchase of the plant. It is understood that the company will have an investment of between $180,000 and $200,000 in the new plant and system.

MIDDLESBORO, KY.—Whether or not the city shall issue bonds to raise $175,000 for construction of a power distribution system and sub-station will be voted on by the citizens at the general election November 3. Mayor Ike Ginsburg was authorized by the city commissioners to contract with the T.V.A. to furnish electrical power (Electrical World, September 12, page 118).

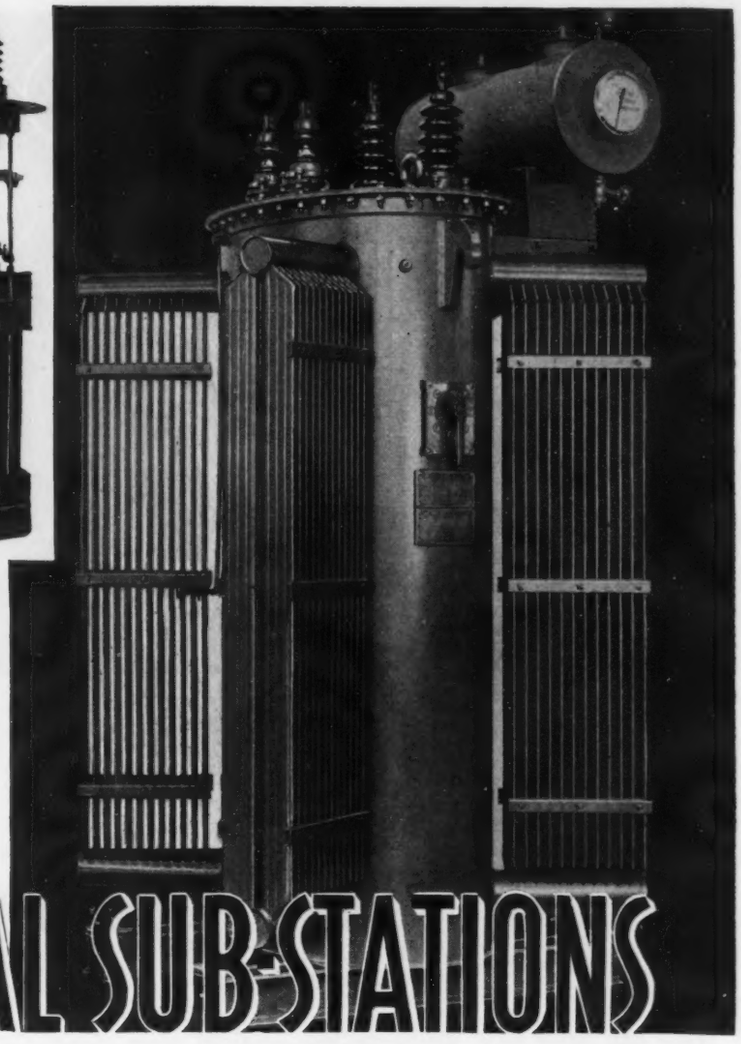
PARIS, KY.—Board of Commissioners has passed an ordinance designed to end distribution by the Kentucky Utilities Company after September 15. The ordinance further states that after a reasonable time the utility company must remove from the streets all poles and apparatus for the conveyance of electricity. The resolution adopted by the Commissioners stated that they felt it "imprudent, inadvisable, impractical and unnecessary" for the city to offer for sale a new electric franchise since the city is operating an electric plant adequate to meet the needs of the town and its inhabitants.

RIPLEY, MISS.—Formal protest against the issuance of bonds for construction of a municipal distribution system for T.V.A. power has been filed by the Ripley Utilities Company with city officials.

TRENTON, MO.—With the awarding by the city of a contract to the Mattison Wallack Construction Company, Oklahoma City, Okla., at $96,935 for the installation of a complete electric distribution system, exclusive of meters and customers services, this city advances another step closer to the completion of the much disputed municipal light and power plant. Shortly after rejecting prior bids on the distribution system on July 29 the city council made it known that it would refuse to purchase the private distribution system of the Missouri Public Service Company. So when the city awarded the new contract employees of the Missouri Public Service Company's plant decided to strike in protest. For a time on September 4 the city found itself without electrical or water service. After a conference with city and company officials the protest strike was called off and service restored (Electrical World, September 12, page 72).



1667 kva., oil insulated, self cooled, 60 cycle, single phase sub-station transformers, 11,000—2400/4160 volts.



ALLIS-CHALMERS POWER TRANSFORMERS

for INDUSTRIAL SUB-STATIONS

are efficient, reliable and convenient to operate!

The tap changer handle, on these transformers, is conveniently located in the side of the case.

Their radiators, manufactured by Allis-Chalmers, are of a new design of exceptionally open construction, making them easily accessible for cleaning and repainting.

The high voltage "one turn per layer" disc coils are of maximum impulse strength and are mechanically braced against possible distortion.

Ask our nearest representative for full details of these improved transformers.

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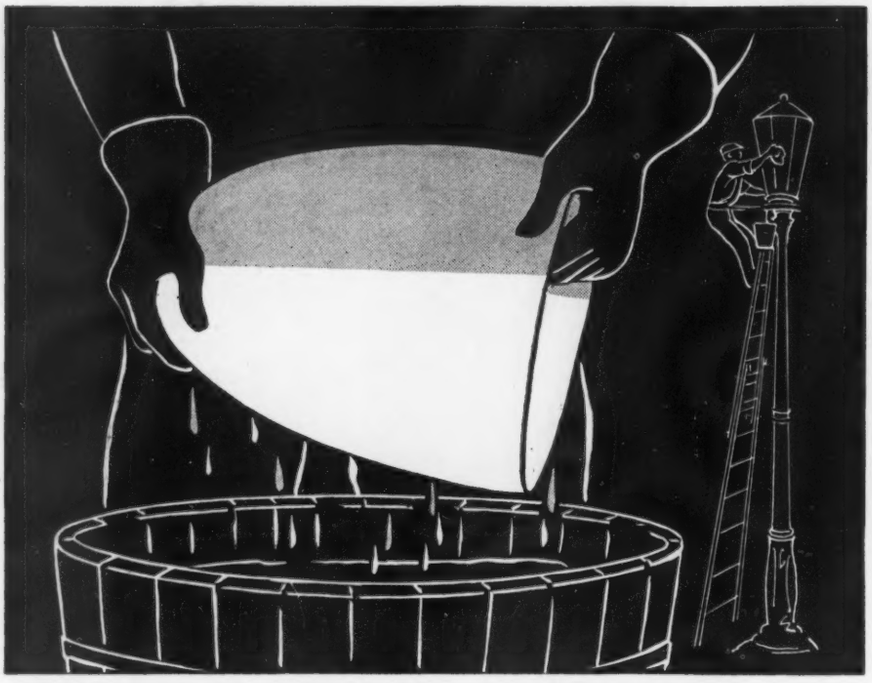


Better Globe Cleaning
with
Skybryte
(in crystal form)

You can now buy Skybryte, the original glass cleaner, in *crystal form*. This means better, lower cost cleaning of Globes, Reflectors and Insulators. The advantages are obvious to any engineer who has bought liquid cleaning compounds.

1. You pay a lower price per gallon. (One pound of 2X Crystals makes 3 gallons of cleaner).
2. You save at least 75% of the freight.
3. You eliminate the nuisance of leaky barrels.
4. You eliminate a nasty storage problem.
5. The cleaner can be mixed right on the job.
6. The strength can be adjusted *exactly* to the amount of dirt on the glass.

For twenty years Skybryte has been sold on a money-back guarantee that it will make glass clean and sparkling. For twenty years Skybryte has been the leading cleaner on the market.

If you are not already using Skybryte to clean your street-lighting glass, use the coupon below to bring a free one-pound sample. It will make 3 gallons of the finest glass cleaner you have ever used.

The Skybryte Company
3100 Perkins Avenue
Cleveland, Ohio

Gentlemen: Please send us free of charge a one-pound sample of Skybryte 2-X Crystals.

Company Name.....

Address.....Per.....

Recent Rate Changes

NARRAGANSETT ELECTRIC COMPANY has announced reductions in rates that will mean a yearly saving of $409,000 to consumers. Frederick A. Young, director of the state division of public utilities, stated that the revised schedule is the greatest single reduction in cost of electric energy ever effected in Rhode Island. Mr. Young said that about 114,000 domestic customers connected to the lines of the company participate in the saving. More than 50 per cent of the total reductions will go to domestic consumers.

MOUNTAIN STATES POWER COMPANY has reduced its commercial and residential rates to 25,000 customers in Oregon. Reductions averaged 12½ per cent and amount in total to $75,000 annually. In the commercial schedule there has been a reduction of 1 cent in each step of the rate. Residential schedules have been consolidated to one combination rate covering all service though this rate varies in the three different divisions of the company's territory due to varying controlling conditions. Rural customers benefit by permission to install motor equipment up to 7½ hp. instead of 3½ as formerly.

TUSKEGEE LIGHT & POWER COMPANY has been ordered by the Alabama Public Service Commission to revise its rates, effecting a savings of $2,000 annually to residential customers and an ultimate rate reduction of 25 per cent. The new rates are patterned after the rates of the Alabama Power Company which offer reduced brackets to consumers who increase their consumption—with the reduction brackets installed as permanent whenever 85 per cent of the customers increase their consumption or automatically at the end of three years. For consumers who do not increase their use, the reduction will not be material.

NEW YORK STATE ELECTRIC & GAS CORPORATION has filed a revision of its primary power rate with the Public Service Commission which is estimated to save primary power users about $4,500 annually in a part of the company's Depew and Lancaster district. The commission permitted the reduction and change in the form of the primary power rate to become effective September 13.

UTICA GAS & ELECTRIC COMPANY has filed revisions of its rate schedules with the New York Public Service Commission which adds a new service classification for large commercial and industrial primary service and which it is contemplated will eventually replace two present service classifications for similar use. It is estimated that the saving will amount to $25,700 annually to consumers being transferred to the new rate.

GULF STATES UTILITIES COMPANY put in effect on September 10 a new schedule of rates that effect a saving of approximately $154,000 to 40,000 residential customers. The company is eliminating its "limited use" rate for domestic users, which covered lighting and small miscellaneous uses, and is doing away with the "room count" feature in other uses. It is estimated that the new rate plan will benefit 80 per cent of the company's domestic customers. The schedule is the second reduction in rates that the company has announced within a few weeks. The preceding cut affected commercial users only.

SUBURBAN GAS & ELECTRIC COMPANY, Revere Mass., has announced a rate cut of $25,000 a year for domestic and commercial customers. The new rate starts about October 1.

If you could spend a day with

JOHN SCHERNER

Mechanical Superintendent

Fisk Rubber Corp., Chicopee Falls, Mass.

John Scherner, left, checks over layout of new conveyor at Fisk plant with John Peterson, supervisor of engineering.

IF IT WERE possible to actually watch John Scherner pursue his many duties at the Fisk plant, here is what you would see in a typical day: Looked over his mail and signed requisitions. Checked over, with Jim Murphy, Chief of Power Plant, the power charts and figures for the preceding day; discussed a steam test of a different grade of coal, and with Don Hanks, Supervisor of Pipe Shop, determined upon the location of new flow meters.

Attended the regular morning meeting of departmental heads with Ed Maynard, Factory Manager, who talked about items of interest in connection with a trip just made to other rubber companies.

Had lunch and played a few games of table tennis with Jack Sweeney, Departmental Superintendent.

Was called down to the Machine Shop to watch the operation of the new golf ball density testing machine just developed, and followed this with a discussion of the following week's work with Maintenance Engineer Henry Paulsen.

Passed through the Electrical Shop on the way back to the office and discussed installation of additional meters, for better check on power consumption, with Perc Butterfield, Chief Electrician.

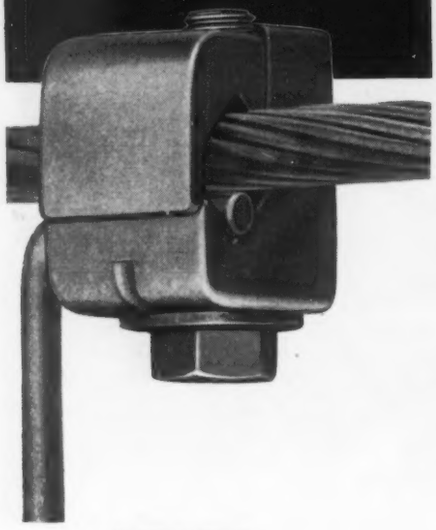
Checked over layout of new conveyor for weighing and handling of raw treads with John Peterson, Supervisor of Engineering.

"Have been reading Electrical World for over 25 years"

Referring to Electrical World, John Scherner says. "I have been reading it for over 25 years, and will probably continue to do so as long as I am in business. It is not alone because of the items of general interest, but also the specific items which help us in the problems of factory operation."

In every branch of the electrical industry, the long-time recognition of Electrical World assures maximum attention for advertising messages. ELECTRICAL WORLD, McGraw-Hill Building, New York, N. Y.

The FARGO UNIT CONNECTOR



"GRIPS like a vise"

SAVES TIME! One-piece design . . . no parts to lose . . . always threaded.

GIVES PERFECT CONTACTS! High compression at low wrench torque. High in conductivity, low in voltage drop. Vibration-proof.

STANDS REPEATED USE! All high strength copper alloy, it is distortion proof. Write to Line Material Co., South Milwaukee, Wisconsin, for full information.

Mfd. by Fargo Manufacturing Co.

Distributed by

LINE MATERIAL CO.

Europe Has Harmony in Utility-Government Arena

[*Continued from page* 38]

them of the smaller and less efficient undertakings.

Acquisition of the smaller public and private utilities must carry fair compensation and there is to be included compensation for loss of future profits.

Other recommendations and conclusions are as follows:

1. That as to holding companies the evidence placed before the committee disclosed the advantages of this form of amalgamation in effecting central management, central purchasing and provision of finance. The committee also find that most of the holding company groups have operated efficiently and have done good work. While there are potentialities of abuse in this form of financial structure the evidence placed before the committee does not lead to the conclusion that such abuse has occurred, and that the criticism of holding companies can only be applied to a limited number. It is recommended that the approval of the Electricity Commission be required in future to the terms of issue of any new capital and that the accounts of holding companies be subject to official audit.

2. That duplicate powers wherever they exist in the same area should be eliminated and that it is essential to prevent the splitting up of comprehensive undertakings by any piecemeal purchase by municipalities at the end of a concession period.

3. The consolidated undertakings which will result from these recommendations are to aim at uniformity of tariffs.

4. That municipalities might be empowered to participate in a guarantee of revenue in connection with rural supplies given by private utilities where the return is incommensurate to the expenditure.

5. It is desirable that an uniform rating method be applied to all electricity undertakings both public and private.

Especially after hearing the tirade from Mr. Davidson of New York City, my plea is this: if we want to develop our industry to the advantage of our consumers and millions of small investors in our stocks, let us for Heaven's sake keep the politicians away from this industry of ours which we are all so proud to belong.

Highway TRAILERS

More TON MILES Per Transportation Dollar

From the world's largest and most complete trailer and body plant, eighteen years of continuous and successful trailer manufacturing is clearly reflected in every model.

Highway Trailers are easily handled, rugged enough to withstand overloading, and the destructive effects of continuous operation over rough country roads.

There are types for every need to solve your problems of transporting long loads of poles, pipe, girders, trusses, transformers, reels of cable and other materials used by utility organizations.

HIGHWAY TRAILER CO.
EDGERTON, WISCONSIN

SALES OPPORTUNITIES IN NEW CONSTRUCTION

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until October 5 for three 15-kv. oil circuit breakers and accessories for switchyard at Norris hydroelectric power plant. Also, until October 7, for operating machinery for lock gates and segmental valves for locks at Guntersville and Chickamauga dams.

BAY CITY, TEX.—Will take bids soon for city-owned electric power plant, including three Diesel engine-generator units and accessories. Local distribution system of Central Power & Light Company will be acquired for municipal property, and extensions and improvements made, including new lines. Entire project will cost about $225,000. Garrett Engineering Company, 308 Hughes Street, Houston, Tex., is consulting engineer.

FERGUS FALLS, MINN.—Lake Region Co-operative Electric Association, Bayley Building, Fergus Falls, Noble Huse, secretary, has plans maturing for first section of transmission and distribution lines for rural electrification in part of Otter Tail County, totaling about 400 miles, with power substation and service facilities. This will be followed by second section of approximately 300 miles in other territory. Entire project will cost $720,000. Financing is being secured through Federal aid. Arnold J. Christopherson is electrical engineer.

CHICAGO, ILL.—Arnold Schwinn & Company, 1718 North Kildare Avenue, plans installation of motors and controls, conveyors and other equipment in new addition to bicycle-manufacturing plant. Cost about $125,000. Superstructure will begin soon.

NEWPORT BEACH, CALIF.—Southern California Edison Company, Los Angeles, plans 2300-volt transmission line over Harbor Island channel, Newport Bay district. Application has been made for permission.

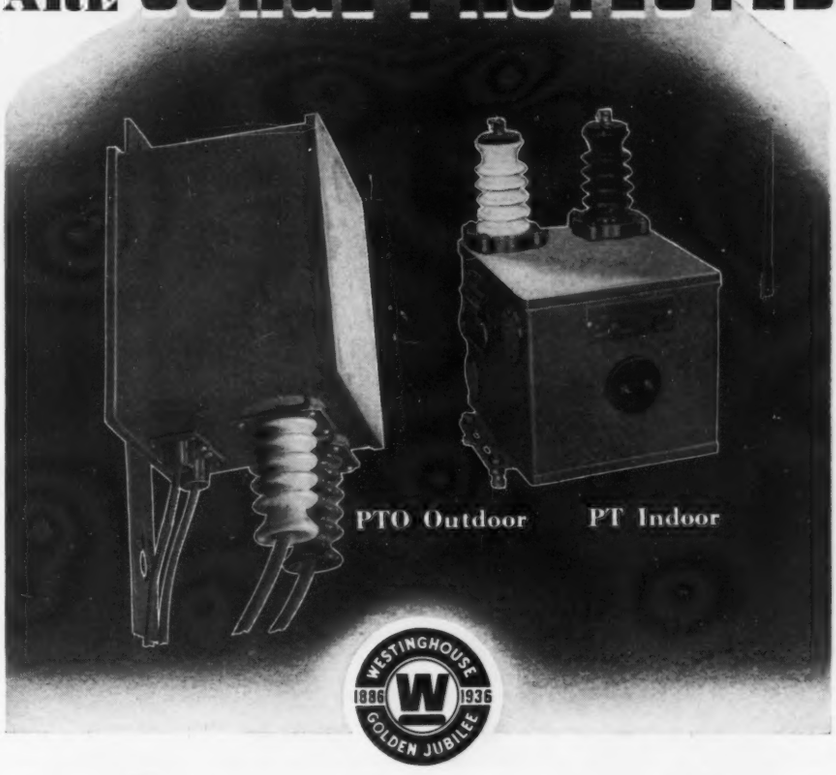
PORTLAND, ORE.—Williams & Company, N.E. Union and Tillamook Streets, plan installation of motors and controls, conveyors and other equipment in new food products manufacturing plant, location noted. Cost close to $100,000. F. Marion Stokes, Terminal Sales Building, is architect.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, receives bids until September 29 for one motor-generator set, d.c. type, for Naval Air Station, San Diego, Calif. (Schedule 8792).

LENOIR, N. C.—Caldwell County Rural Electric Co-operative, Inc., care of Ransom R. Corpening, Gamewell, N. C., chairman, recently organized, plans transmission and distributing lines for rural electrification in portion of Caldwell County, totaling about 400 miles, with power substations and service facilities. Work is scheduled to begin soon. Fund of $430,000 has been secured through Federal loan and grant. Spoon & Lewis, Greensboro, N. C., are consulting engineers.

CLEVELAND, OHIO—Has plans maturing for extensions and improvements in municipal electric power plant at Lake Front and East Fifty-third Street used for

THESE POTENTIAL TRANSFORMERS ARE SURGE-PROTECTED



DANGEROUS voltage surges never reach the windings of PT and PTO potential transformers. They are shunted to ground before they have a chance to do any harm. The bushings flash over before the coils are subjected to dangerous potentials.

This exclusive performance is assured by:

1—Winding the high-voltage coil on a Moldarta spool into the center of which is slipped the low-voltage coil wound on a Micarta spool. In addition, every part of the windings adjacent to the iron core is protected by Micarta channels.

2—A new plastic insulation that has the high dielectric characteristics of solid insulation and a dielectric strength well in excess of the combination of insulation and oil used in ordinary oil-insulated instrument transformers. Distinctly a Westinghouse development, this special insulation compound thoroughly impregnates the coils and entirely fills the sheet-metal cases of PT and PTO Potential Transformers.

Your Westinghouse representative will be glad to give you the many other outstanding advantages of these transformers. J 70028

Westinghouse

Make FIRST *Cost the* ONLY *Cost*

ROCKBESTOS A.V.C.
600 Volt Power Cable
1. Conductor
2. Felted Asbestos
3. High Dielectric Insert
4. Felted Asbestos
5. Asbestos Braid

We'll agree that initial cost is the sum of material and labor, but maintenance should be considered too, when you're buying wire. Wire failure with its delays, shutdowns, replacement material and labor costs, frequently runs up maintenance expense that magnifies what seemed to be an economical first cost.

For severe conditions you need a wire that you can install and forget —one that will last indefinitely and give the most economical *year-in-and-year-out service*. ROCKBESTOS wires will do just that for you because their primary characteristic is permanence. Insulated with specially processed asbestos, they are highly resistant to heat, moisture, acids, oils and greases and will not dry out or deteriorate with age.

Briefly, ROCKBESTOS wire is still new when ordinary wires have deteriorated to the point of failure. Its use practically eliminates wire failure and all the expense that comes with it. In addition, savings may be realized in footage because ROCKBESTOS can be run direct, regardless of heat, vibration, or other insulation destroyers. More than fifty different money saving constructions are described in our catalog. May we send you one? Rockbestos Products Corporation, 829 Nicoll Street, New Haven, Conn.

"Also refer to Electrical World Buyer's Reference Number of Dec. 21, 1935, Vol. II."

ROCKBESTOS A.V.C.
the wire with permanent insulation

public works service, including installation of new turbo-generator unit, about 25,000-kw. capacity, and auxiliary equipment, with expansion in power substation facilities, transmission and distributing lines. Cost estimated at $3,000,000, of which approximately $2,200,000 will be arranged by municipal bond issue and remainder through Federal aid.

LURAY, VA.—Purchasing Officer, Department of Interior, Washington, D. C., receives bids until September 28 for large quantities of telephone cable and telephone loading coils for Luray (Proposal 1795).

TROMMALD, MINN.—Butler Brothers, 138 East Eighth Street, St. Paul, Minn., plan installation of heavy-duty motors and controls, power substation equipment, electric hoists, conveyors and other equipment in proposed iron ore concentration plant at ore-mining properties near Trommald. Entire project is reported to cost over $1,000,000.

JACKSON, TENN.—West Tennessee Electric Membership Corporation, recently organized, plans transmission and distributing lines for rural electrification in parts of Crockett, Hayward, Gibson, Madison and Obion Counties, totaling about 300 miles, with power substation and service facilities. Fund of $335,000 has been secured through Federal aid. Work is scheduled to begin soon.

CHICAGO, ILL.—Commonwealth Edison Company has taken out a permit for initial work for expansion in power plant at 1121 Cermak Road, to cost over $100,000, and will proceed with project at once. Station will be enlarged and new equipment installed. Entire cost of program has not been announced.

STOCKTON, CALIF.—Sierra Mountain Water Company, Stockton, plans hydroelectric power development on Consumnes River, Amador County, where site has been selected. Plant will have a capacity of 13,480 hp., with installation to include main outdoor power substation, transmission and distributing lines, switching stations and other structures. Cost close to $7,000,000. Application has been made for permission.

WESTBY, WIS.—Vernon County Electric Co-operative Association, H. O. Melby, Westby, president, plans transmission and distributing lines for rural electrification in parts of Vernon, Monroe, Sauk, Crawford, La Crosse and Juneau Counties, totaling over 450 miles, with power substation and service facilities. Fund of $480,000 has been secured. Work will begin soon. E. B. Wayte, Wisconsin Rural Electrification Authority, Capitol Building, Madison, Wis., is engineer.

BRAZORIA, TEX.—Jefferson Lake Oil Company, New Iberia, La., plans installation of transformers and auxiliary equipment, motors and controls, conveyors, electric hoists, loaders and other equipment in new sulphur mining and refining plant in Clemens Dome district, near Brazoria, where tract of 50 acres of land has been acquired. A power house is planned. Entire project will cost close to $450,000.

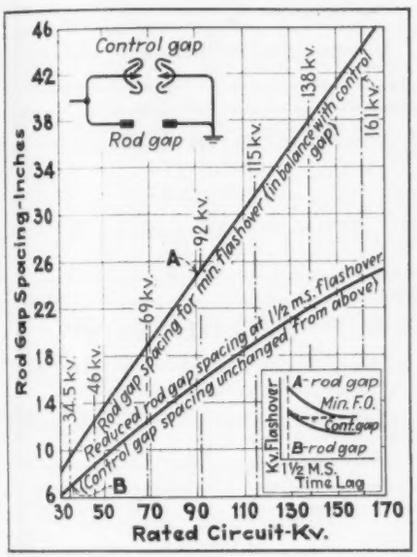
SUDBURY, ONT.—Ontario Hydro-Electric Power Commission, Toronto, Ont., plans rebuilding of portion of hydroelectric generating station at Stinson on Wahnapitate River, vicinity of Sudbury, recently destroyed by fire. Loss estimated close to $300,000, including equipment.

Control Gap Protects Station Equipment

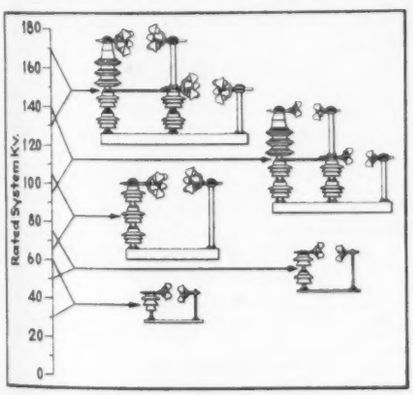
[*Continued from page 46*]

afford the requisite protection, even though having an arcing voltage comparatively low for less severe impulses or those of longer duration. This means that a gap should have polarity and time-lag characteristics patterned after the insulation to which it is to give paralleled protection.

The new gap may thus be said to function like spheres under surge conditions and like points at power



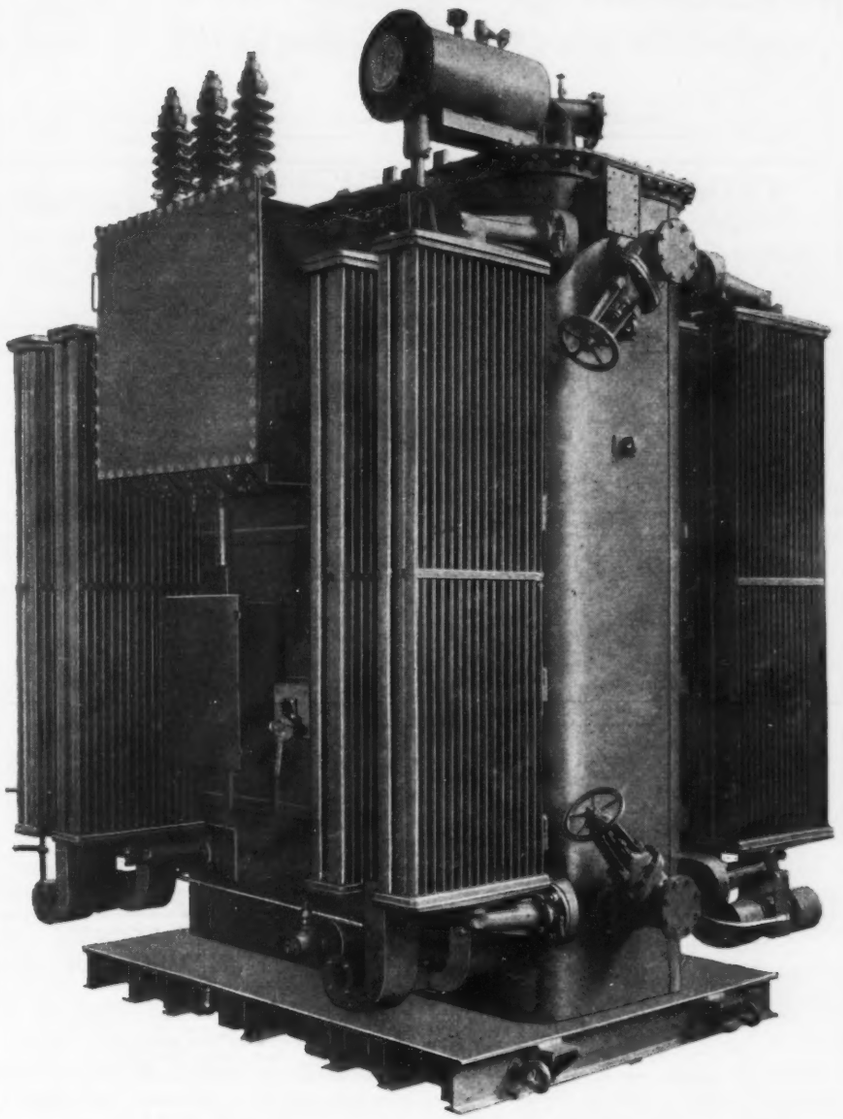
Protection afforded is better than for equivalent rod gap



Series of assemblies covers from 30 kw. upward

frequency. The resemblance to the uniform flux distribution of the sphere is obtained by means of three (six for higher voltages) insulated electrodes surrounding the point arcing terminals. They are so placed that they increase the effective electrode area, but are insulated to prevent flashovers at other points than the intended arcing terminals.

POWER TRANSFORMERS



The Wagner plant is fully equipped to build single- or three-phase power transformers in standard sizes and voltages. The transformer here illustrated is a 12,000-kva, 34,500-volt delta to 4500-volt Y, three-phase air-blast power transformer fully equipped with the latest relay and control devices.

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Hydrogen-Cooled Changer

[*Continued from page 42*]

members for the motor and generator elements and each of the remaining four sections houses a bearing, pedestal and hydrogen cooler sections. Dimensions of the sections are such that each can be assembled and shipped with its quota of apparatus as a complete unit.

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Handbook of Engineering Fundamentals

By Ovid W. Eshbach. Published by John Wiley & Sons, Inc., New York City. 1081 pages, illustrated. Price $5.

In education circles, there is a movement to integrate all engineering, relate it more intimately to its physical science sources and show the general unity of technologic principles. This book by 40 specialists directed by Eshbach anticipates the evolution of that new pedagogic trend and is thus perforce a unique presentation, not of the formulism, design technique and operating practice in engineering, but of the mathematical, physical and chemical bases on which engineering rests in welding phenomena to material properties.

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There is a brief concluding chapter on contracts which seems to belong elsewhere than in this compilation of science tools for engineers.

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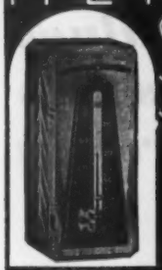

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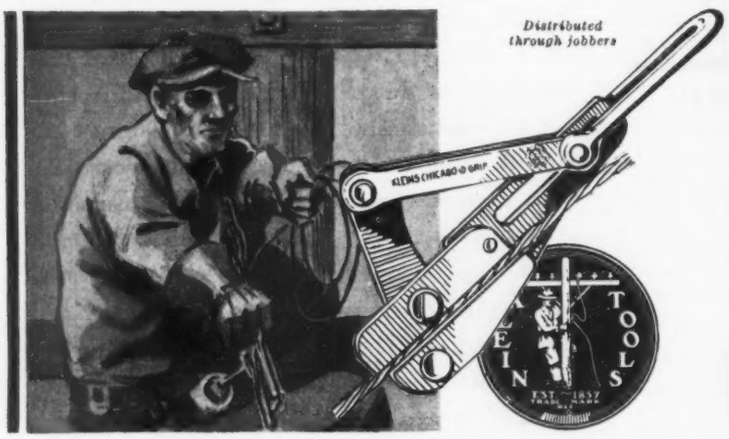

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